THE TUNDZHA REGIONAL ARCHAEOLOGY PROJECT

Surface Survey, Palaeoecology, and Associated Studies in Central and Southeast Bulgaria 2009–2015

FINAL REPORT

Edited by Shawn A. Ross, Adela Sobotkova, Julia Tzvetkova, Georgi Nekhrizov, and Simon Connor

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Front cover: Top: View of the Kazanlak Valley looking north to Mt Botev (courtesy Matyáš Kracík); bottom: view of the Yambol province landscape looking north to the Stara Planina (courtesy Shawn Ross).
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Bryan Zlatos

Absolute chronology

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Much more than charm was necessary for us to conduct three years of total-coverage survey in the formidable landscapes of the Kazanlak Valley and Thracian Plain. Serendipity and dedicated Bulgarian partners, who worked tirelessly to convince colleagues about the benefits of survey and procured permits season after season, were the main ingredients to our access to the valley. This volume is evidence of their persistence, willingness to take up a challenge and ability to collaborate despite cultural, linguistic, and methodological differences, bridging disciplinary and administrative boundaries in the process.

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Abstract

This volume presents the results of diachronic archaeological and palaeoecological research conducted in two study areas: the intermontane Kazanlak Valley along the Upper Tundzha River of central Bulgaria, and the Thracian Plain along the Middle Tundzha River south of the city of Yambol in southeastern Bulgaria. The Tundzha Regional Archaeology Project (TRAP), a cooperative effort including Australian, Bulgarian, and Czech investigators, undertook archaeological survey and environmental sampling between 2009–2011. Major field activities of the project included over 100 sq km of systematic pedestrian survey, legacy data verification and mapping, trial excavations, artefact processing, and environmental sampling in and around the study areas. Through this research, TRAP inventoried over 100 surface artefact concentrations and 800 burial mounds. At the heart of the volume is a geospatial analysis of settlement patterns derived from the survey dataset, which relates the footprint of past human activities to environmental and sociocultural drivers. We also present a range of associated studies conducted between 2009–2015: histories of archaeological research in both study areas, soil erosion and productivity modelling in the Kazanlak Valley, reconstruction of a 30,000-year environmental history based on samples from a wetland in the Thracian Plain north of Yambol, investigation of palaeodiet using isotope analysis of human remains from Bronze Age burials in the Yambol study area, exploration of shifting Roman occupation patterns based on trial excavations in the Yambol area, research into subsistence strategies based on palaeobotanical evidence recovered from one of the Yambol area trial excavations, analysis of trade and exchange based on the transport amphorae fragments recovered during Yambol-area survey, and epigraphic comparison and synthesis of Classical, Hellenistic, and Roman inscriptions from the two study areas. Finally, TRAP has produced a granular digital dataset of surface artefacts and features unparalleled in Bulgaria to promote reinterpretation of our results, encourage secondary studies, and foster comparative research.

Keywords landscape archaeology; palaeoecology; archaeological survey; soil analysis; epigraphy; ancient Thrace; Bulgaria

PART I
Background and Methods

1

The Tundzha Regional Archaeology Project: history, aims, and outcomes

Shawn Ross, Adela Sobotkova, and Simon Connor

Abstract *This Final Report is the principal outcome of Tundzha Regional Archaeology Project (TRAP) fieldwork conducted between 2009 and 2011, as well as associated studies that continued through 2015. Research focused on two study areas: the Kazanlak Valley and the Thracian Plain south of Yambol. TRAP was the first international, multidisciplinary, diachronic landscape archaeology project of its kind in Bulgaria. This chapter contextualises TRAP's research program by telling the story of the project, including both successes and challenges. Here, we recount how the diverse investigators came to undertake a large-scale field project in Bulgaria, how the study areas and research approaches were selected, and how project objectives evolved. We also describe how the project was structured and operated. Project leaders strove to use best practices from landscape archaeology as it is practiced elsewhere in the Mediterranean, and introduced new digital approaches to field recording. Project aims ranged from the documentation of archaeological heritage for cultural heritage management to the investigation of settlement patterns and their evolution in historical and environmental context. Key objectives were met. The project team, including over 100 students, volunteers, and other participants, covered over 100 sq km in pedestrian survey, and conducted trial excavations, palaeoenvironmental research, and related investigations over five field seasons. Key outcomes include a 30,000-year palaeoecological record and an inventory of over 100 flat sites and 800 burial mounds, allowing a re-evaluation of long-term changes in subsistence strategies and social organisation in Thrace.*

Keywords *landscape archaeology; archaeological survey; palaeoecology; palaeoenvironment; ancient Thrace; Tundzha Regional Archaeology Project*

1.1. History of the Project

The Tundzha Regional Archaeology Project (TRAP) was inspired by the experiences of its leaders on earlier projects around the Mediterranean and Black Seas. These experiences suggested that landscape archaeology, supported by systematic, pedestrian survey and palaeoenvironmental research, represented an underutilised and potentially fruitful approach to archaeology in Bulgaria, one that could reveal much about ancient subsistence strategies and human-environment interaction. Pedestrian surface survey had previously been used mostly as a means of locating sites to excavate, rather than an independent research method. Palaeoecological studies had tended to focus on mountains and coastlines, avoiding inland, lowland sites considered marginal or compromised by recent human activity, particularly in the agricultural areas of the Thracian Plain. Too few projects, moreover, had combined multidisciplinary environmental science and landscape archaeology to investigate cultural change in its environmental context through successive archaeological periods. Together, we determined that these approaches had the potential to shed light on fundamental questions, ranging from the introduction of agriculture into Europe, to the emergence and evolution of complex societies in the Balkans. We believe that the results of TRAP research presented here and elsewhere justify our initial optimism – although, as is the case with many archaeological projects, our research program evolved considerably between inception and execution.

Shawn Ross and Adela Sobotkova first worked in Bulgaria during 2004–2005 at the Krsto Pokrovnik excavations in the Struma Valley, directed by Mark

Stefanovich of the American University of Bulgaria, Blagoevgrad, and Ilija Kulov of the Blagoevgrad Historical Museum (Stefanovich and Kulov 2007). These excavations explored a Late Bronze Age stronghold, and initiated Ross's and Sobotkova's interest in Bulgarian archaeology. Based on this work, Sobotkova decided to focus her doctoral training (initiated in September 2005 at the University of Michigan) on the archaeology of ancient Thrace, while Ross successfully applied for a Fulbright Global Scholar Award to explore trade and cultural exchange between the Greek world and the interior of the Balkans. Ross's Fulbright Award supported a six-month stay as a Visiting Assistant Professor at the American University of Bulgaria, Blagoevgrad (January–June 2006). It also allowed him to establish connections with the nascent American Research Centre in Sofia (ARCS) and, through it, to other Bulgarian archaeologists. This networking, in turn, led to a collaboration with the Yambol History Museum and the Department of Archaeology at the University of Sofia St. Kliment Ohridski to investigate the area around the ancient city of Kabyle, situated on the Thracian Plain near Yambol. In the summer of 2007, reconnaissance (assessing terrain, land use, and surface visibility) was conducted around Kabyle to inform the design of a pilot archaeological research project, planned for the following year.

In the summers of 2007 and 2008, Ross and Sobotkova also joined the L'Amastuola Archaeological Project, directed by Gert-Jan Burgers (Vrije Universiteit Amsterdam and Koninklijk Nederlands Instituut Rome), with the task of using high resolution, multi-spectral satellite imagery to identify archaeological sites in a 100 sq km study area centred on L'Amastuola, located in the coastal plain of Taranto, Italy. Remote sensing results were then compared with pedestrian survey results from the related Murge Tableland Survey where the study areas overlapped, allowing an assessment of the remote sensing approach, and an idea of how its recovery rates compared with pedestrian survey (Ross, Sobotkova, and Burgers 2009). Collaboration with Professor Burgers profoundly influenced TRAP's survey methodology, and offered an opportunity to explore the ability of satellite remote sensing to locate typical, small sites in a Mediterranean context.

Meanwhile, Simon Connor had been working for some years in the Caucasus, particularly on the volcanic plateaux in the Georgian-Armenian borderlands, where millennia of human impact and climate change had sculpted the vegetation. His research combined archaeological and palaeoecological data, involving collaboration with Eliso Kvavadze, Tony Sagona, Tamaz Kiguradze, Zaal Kikodze, and other researchers. While in Georgia he developed a strong interest in the Black Sea region, with its unique biodiversity and long human history. When Scott Mooney (University of New South Wales) suggested Connor become involved in an archaeological project on the opposite side of the Black Sea, he did not hesitate to join TRAP in 2008.

The TRAP project began in early spring 2008, with a two-week pilot project in the vicinity of ancient Kabyle, led by Ilija Iliev (Yambol History Museum), Kostadin Rabadjiev and Ivaylo Lozanov (University of Sofia), Shawn Ross, Adela Sobotkova, and Simon Connor (Ross *et al.* 2010). The goals of this project were to (1) assess the viability of pedestrian surface survey as a research method in the Middle Tundzha Valley, (2) assess the feasibility of palaeoecological research in the lowlands of the Thracian Plain, and (3) assist with archaeological prospection where the planned Thrakia Highway crossed the Kabyle Archaeological Reserve. This pilot project allowed TRAP to test and evaluate survey methods, seek out lakes and wetlands suitable for palynological study, and test digital field recording techniques. TRAP surface survey was immediately productive, covering approximately 2.85 sq km in 10 days. The mapping of surface artefacts helped guide additional rescue work before the construction of the Thrakia Highway (Ross *et al.* 2010, 70; Bakardzhiev 2010). Initially the palaeoecological potential of area seemed limited, until Iliev spoke with a local historian to identify lakes and wetlands that had been partially drained in the early twentieth century. TRAP subsequently sampled the Straldzha Mire for palaeoecological analysis, successfully recovering evidence that has rewritten the history of human-environment interactions in the Thracian Plain (Connor *et al.* 2013).

Based on successful preliminary research in both Italy and Bulgaria, an Australian Research Council (ARC) Linkage Project application was submitted in June 2008. Linkage Projects are grants that involve investigators from Australian universities in partnership with researchers from other organisations, including at least one from the non-university sector (*e.g.*, government, industry, or non-profit). Ross was Lead Chief Investigator, with the University of New South Wales (UNSW) as Lead Organisation. Other investigators and organisations continued from 2007–2008 research in Italy and the 2008 pilot project in Bulgaria.

The Linkage Project application envisioned a diachronic, comparative landscape archaeology project exploring Apulia, Italy, and the Thracian Plain, Bulgaria. Its aims included:

1. Locate and inventory previously unknown archaeological sites and features using satellite remote sensing, pedestrian survey, and geophysics, followed by test excavations in selected areas.
2. Evaluate the effectiveness of satellite remote sensing for detecting small-scale archaeological sites in Mediterranean and transitional Mediterranean-Continental zones.
3. Reconstruct environmental change since the end of the last ice age, using a range of palaeoecological and geomorphological approaches.

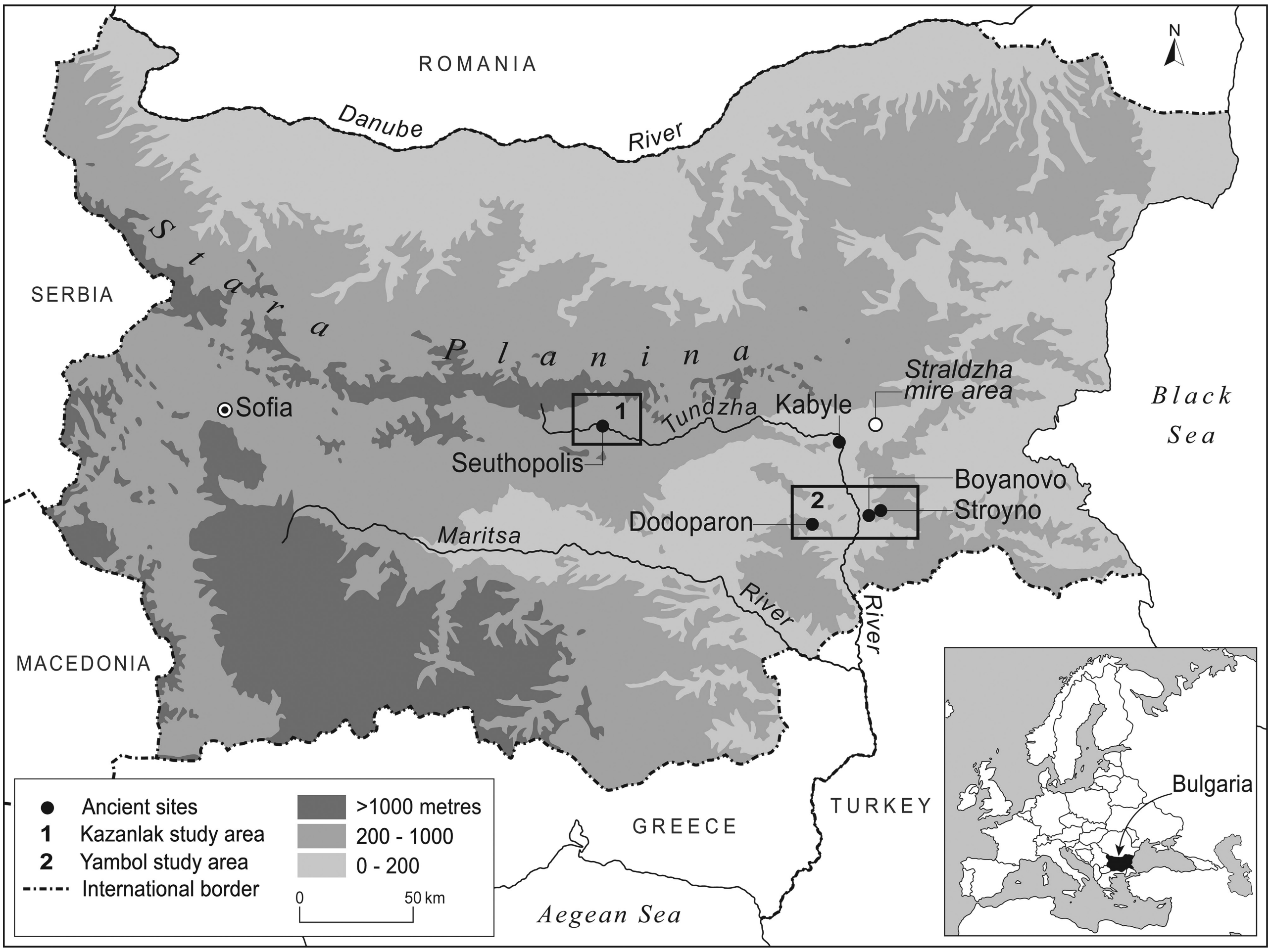

Figure 1.1 Location of Kazanlak and Yambol study areas

4. Assess settlement patterns, productive strategies, and the concomitant rise of and interactions between complex societies.
5. Evaluate and explain environmental and agricultural trajectories over the long term.
6. Develop site location models and comprehensive cultural heritage management plans for both study areas.

The proposal included publication of comprehensive digital datasets as well as more traditional outputs like journal articles and, ultimately, an edited volume.

In November of 2008 we learned that the application was successful. Almost immediately the project had to be restructured. Our partners at Koninklijk Nederlands Instituut Rome (KNIR) were unhappy with the budgetary and intellectual property stipulations in the ARC Linkage Project deed, while the Kabyle team from the University of Sofia decided that their priorities had moved away from regional survey. Finally, as is usually the case, the ARC only partly funded the grant (ca. 75% of the request).

In the wake of these challenges, Ross and Sobotkova spent several months in late 2008 and early 2009 reorganising the project. With the departure of KNIR and associated researchers, along with the reduced budget, we chose to eliminate the Italian half of the project and focus exclusively on Bulgaria. We also began coordinating with the Yambol History Museum to find a new study area that would not impinge on the University of Sofia's work around Kabyle, and we again sought out other Bulgarian researchers interested in surface survey. That search resulted in the addition of the Kazanlak study area as a complement to Yambol and Georgi Nekhrizov (National Archaeological Institute and Museum, Bulgarian Academy of Sciences), and Julia Tzvetkova (University of Sofia) as investigators.

The withdrawal of KNIR caused difficulty, as the Institute was to provide the cash co-investment required of Linkage Project by the ARC. To compensate, the American Research Centre in Sofia (ARCS) joined the project formally as a partner organisation, and we won the first Institute for the Study of Aegean Prehistory (INSTAP) grant for Bulgaria to partially replace the lost KNIR contribution. Currency fluctuations and other repercussions of the Global Financial Crisis prevented us from fully meeting the ARC's co-investment requirements, but our partner organisations increased their in-kind contributions

Table 1.1 TRAP 2009–2011 campaign by the number

3	years of pedestrian survey
2	geographic zones (the Kazanlak Valley and the Thracian Plain)
3	study areas (Kazanlak in Stara Zagora Province, Elhovo and Dodoparon in Yambol)
8	field activities
5	field seasons (three in Kazanlak, two in Yambol)
4	test excavations (2031, 2032, 3055, 8024)
104	participants
270	team-days of pedestrian survey (198 in Kazanlak; 72 in Yambol)
123	sq km surveyed (85.9 in Kazanlak; 37.2 in Yambol)
12,480	survey units (7,708 in Kazanlak and 4,772 Yambol)
199,585	surface artefacts counted (86,251 in Kazanlak; 113,334 in Yambol)
2,645	artefacts collected (1,017 in Kazanlak; 1,628 in Yambol)
106	surface concentrations documented (82 in Kazanlak; 24 in Yambol)
825	burial mounds registered (773 in Kazanlak; 52 in Yambol)
743	artefacts inventoried
710	environmental samples taken (555 palaeoecology; 155 geoarchaeology)
33	radiocarbon dates
287,512	total budget in AUD$ (2009–2012 fieldwork, processing, and analysis)

and the ARC approved a variation lowering the cash contribution to the project. Overall, we were left with about AUD $125,000, some two-thirds of our original budget.

After these revisions to partnerships, investigators, study areas, and budgets, our project was much more focused and, in the end, more coherent. We would work in two study areas, both associated with the Tundzha River: the intermontane Kazanlak Valley surrounding the early Hellenistic city of Seuthopolis, and the Middle Tundzha River area of the Thracian Plain, south of ancient Kabyle and around important middle-tier sites such as Stroyno-Yurta and Dodoparon (see Fig. 1.1). Palaeoecological work would likewise be constrained to the Thracian Plain and surrounding uplands. Finally, while our original project had been animated by a comparison of Greek and Roman trade, contact, and interaction in Apulia and Thrace, the re-scoped project focused much more on fundamental palaeoenvironmental and landscape archaeology and societal evolution in the Tundzha River catchment (without, we hope, neglecting intercultural influences). Otherwise, within the redefined study areas, our aims remained the same as in the original application.

After these birthing pains, the project progressed well (see Table 1.1 for key project statistics and Table 1.2 for a schedule of field seasons). Funding shortfalls were addressed through the active recruitment and training of volunteers and a series of small grants, including a grant from the Australian Institute for Nuclear Science and Engineering Awards for radiocarbon dating and a grant for satellite imagery from the GeoEye Foundation. A larger grant from the America for Bulgaria Foundation International Collaborative Archaeological and Bioarchaeological Research Program, led by Sobotkova, funded excavations at Dodoparon in 2010 and additional palaeoecological research by Simon Connor. Finally, an Australian Government Department of Education, Employment, and Workplace Relations (DEEWR) Short-term Mobility Program grant allowed us to subsidise the expenses of 12 student volunteers from UNSW to participate in fieldwork during 2011. This final grant was particularly rewarding, in that it allowed us to recruit a group of extraordinarily talented and motivated undergraduate students. Because of this funding, and economising wherever possible, we were able to conduct five field seasons and undertake all the major activities originally proposed, including survey, satellite remote sensing, geophysical investigation, test excavation, soil sciences, and palaeoecology. In addition, members of the TRAP team undertook palaeobotanical, epigraphical, and ceramic studies that had not initially been envisioned.

Data analysis proceeded alongside fieldwork. Preliminary field reports were published regularly, with a preference for venues accessible to Central and Eastern European research communities (Sobotkova *et al.* 2010; Nekhrizov *et al.* 2011; Iliev *et al.* 2012). Since the conclusion of fieldwork, our efforts have focused on completing this volume, but also include other publications. Sobotkova authored interpretive studies, including her dissertation (Sobotkova 2012), as well as contributions to a recurring international workshop on the Black Sea in antiquity (Sobotkova 2013; 2016). Results synthesising archaeological and palaeoecological data were first presented at a symposium on settlement life in ancient Thrace held in Yambol, Bulgaria, in 2012, and more developed versions of these papers anchored a session on human-environment interactions (chaired by Ross) at the 19th Annual Meeting of the European Association of Archaeologists held in Pilsen, Czech Republic, in 2013. Our analyses and interpretations of the Straldzha Mire sediments were published in *Quaternary Science Reviews* (Connor *et al.* 2013). Seeking to reach a wider audience, we have also published a peer-reviewed article aimed at high school teachers of ancient history (Ross and Sobotkova 2015), and produced a documentary video with UNSW TV intended for classroom use with undergraduates (https://youtu.be/nGwVUlWoIyc). Our publication efforts continue. In addition to this volume, a number of specialised publications are nearing completion

Table 1.2 TRAP and associated field activities

Year	*Season*	*Approximate dates*	*Location*	*Activity*
2008	Spring	February	Yambol Region: Kabyle study area	Pilot project: Surface survey; artefact processing; environmental sampling
2009	Spring	March–April	Kazanlak	Surface survey; artefact processing; SRS ground control; legacy data verification; environmental sampling
2009	Spring	May	Kazanlak: 2031; 2032; 3055	Geophysics; excavation; artefact processing
2009	Autumn	September–November	Yambol region: Elhovo study area	Surface survey; artefact processing; SRS ground control; legacy data verification; environmental sampling
2010	Spring	March–May	Kazanlak	Surface survey; artefact processing; SRS ground control; legacy data verification; environmental sampling
2010	Autumn	October–December	Yambol region: Dodoparon study area	Surface survey; artefact processing; SRS ground control; legacy data verification; environmental sampling
2010	Autumn	October–December	Dodoparon 8024	Excavation; artefact processing; palaeobotany
2011	Autumn	October–December	Kazanlak	Surface survey; SRS ground control; legacy data verification; environmental sampling; geoarchaeological survey
2013	Autumn	September	Yambol	Attempt at OSL dating of burial mounds
2014	Autumn	September–October	Stroyno-Yurta 6018	Excavation; artefact processing; palaeobotany
2015	Autumn	September–October	Stroyno-Yurta 6018	Excavation; artefact processing; palaeobotany

(see 'Outcomes' below), and will be added to our online list of TRAP publications (https://goo.gl/wM7tAm) as they appear. In future, we hope to resume fieldwork in the Yambol province to pursue some of the questions raised by the research presented here.

1.2 Project structure and personnel

TRAP has been a collaboration between international and local partners, led by researchers based in Australia, the United States, and Bulgaria. Bulgarian investigators served as the directors of all fieldwork, obtained all relevant permits, and contributed their extensive local knowledge. Foreign investigators assisted with the planning, establishment, and operation of the projects (assuming the title of 'Supervisors'), contributing international perspectives, methodological expertise, and much-needed funding for research-driven fieldwork (as opposed to cultural heritage management and rescue work, which consume most of the limited time and resources of Bulgarian museum staff). In Kazanlak, Georgi Nekhrizov (National Archaeological Institute and Museum, Bulgarian Academy of Science) served as Project Director, while in Yambol, Ilija Iliev or Stefan Bakardzhiev (Yambol History Museum) filled that role. Shawn Ross (then at the University of New South Wales) and Adela Sobotkova (then a PhD Candidate at the University of Michigan) served as Supervisors in both study areas. Simon Connor (then at the University of Algarve, Portugal) led all environmental sampling work, while the most experienced students associated with the project (from Bulgaria and elsewhere) served as Survey Team Leaders.

TRAP operated a field school each season, involving both Bulgarian and international students. Over the course of the project, a particularly strong connection with Charles University in Prague developed, including the participation of many undergraduate and postgraduate students, three of whom (Petra Tušlová, Barbora Weissová, and Petra Janouchová) became team leaders and undertook their own research, eventually contributing to this volume. Since the conclusion of TRAP fieldwork, they have gone on to work elsewhere in Bulgaria, especially with the joint international project at Pistiros. As noted above, in 2011 a DEEWR Mobility Program grant allowed us to bring a cohort of undergraduate students from UNSW, several of whom, including Robbi Bishop-Taylor, Karina Judd, Len Martin, and Lauren Clear, also contributed to this volume. Watching our Czech and Australian students mature as researchers has been one of the most rewarding aspects

for the more senior members of the TRAP team. A list of participants can be found in the front matter.

1.3 Study areas

Thrace has a rich but underexplored and, in the English-speaking world, neglected archaeological heritage. The region has been inhabited since as early as the Neolithic era, with important Bronze Age, Iron Age, Classical, Late Antique, Mediaeval, and Ottoman remains. Thrace has long been important as a crossroads. Agriculture was likely introduced to Central Europe through Thrace, which also produced Europe's earliest metalworking cultures. Thracians of the interior traded with Greek colonists along the Black Sea coasts, and while they avoided permanent conquest in the Hellenistic period, material and cultural exchange continued. Thrace was incorporated into the Roman Empire ca. 70 BC, joining Mediterranean-wide trade networks. From the fourth century on, it became an epicentre for the migrations which transformed the Roman Empire in Late Antiquity, later becoming a frontier zone for the Byzantine Empire, and finally an important agricultural hinterland of Ottoman Constantinople.

TRAP investigated the Tundzha (ancient *Tonzos*) River catchment in two Bulgarian provinces, Yambol and Stara Zagora, representing the Thracian Plain and its northwest extension into the intermontane Kazanlak Valley respectively (Fig. 1.2). Both areas contain the remains of extensive prehistoric settlements, including some 50 tells in the Yambol province. Two major ancient cities, Seuthopolis in the Kazanlak Valley (inhabited in the early Hellenistic period), and Kabyle about 100 km downstream (eastward) (inhabited from early Hellenistic times through the Roman era), were situated along this river. The Tundzha continues southward from Kabyle, joins the Maritsa near Edirne (ancient Hadrianopolis), and flows into the Aegean, some 175 km distant. Trade routes also pass 75 km to the east, reaching the Black Sea at the Bay of Burgas (the site of extensive Greek colonisation in the Classical period).

The study area in the Stara Zagora province along the Upper Tundzha River was compact and contiguous, comprising the Kazanlak Valley and adjacent parts of the Stara Planina and Sredna Gora foothills (Chapters 5, 6, 7, 8, 9, 10). It is referred to as the 'Kazanlak study area' in this volume (see Figs. 1.1 and 1.2). Here, the project sought to survey the valley and surrounding foothills as completely as possible. The Kazanlak Valley contains several prehistoric tells, while Seuthopolis (now inundated by the Koprinka Reservoir on the Tundzha River) was the focal point and regional centre of the valley during its short period of habitation in the early Hellenistic period. The valley also boasts a first millennium BC mortuary landscape so rich that it is sometimes called the 'Valley of the Thracian Kings', as well as Roman settlements and necropoleis and a major Ottoman town.

The Yambol province, by contrast, contained two discrete study areas sampling different landscapes, the 'Elhovo study area' and the 'Dodoparon study area' respectively. Since the Thracian Plain in Yambol is much larger and less well bounded than the Kazanlak Valley, TRAP chose contiguous study areas surrounding known sites of ancient activity from various periods. The Elhovo study area, investigated in 2009, included a ridgeline between two tributaries of the Middle Tundzha River in the heart of the Thracian Plain (Chapters 12, 13, 14, 15, 16; see Fig. 1.3). Two mounds on top of this ridge were excavated in 2010, yielding significant Bronze Age burials (Chapter 17). The area also contains the Roman veterans' settlement of Stroyno-Yurta (Chapter 18), and evidence of Post-Classical habitation. The Dodoparon study area, investigated in 2010, explored rolling terrain along the plain's southern edge. The principal site here is the Late Roman fortified settlement of Dodoparon (Chapter 19). Both Yambol study areas lay along ancient transportation routes to Kabyle, situated a few tens of kilometres to the north of them.

1.3.1 General conditions for survey

In general, conditions for survey were excellent, especially in comparison to, for example, Greece or Italy. Most of the surveyed area was agricultural, and little of it fenced or otherwise obstructed. Passability and visibility were very good. Background scatters were generally light, making surface artefact concentrations easy to identify. Agricultural activities tended to be less aggressive than what we have seen elsewhere in the Mediterranean, without mass movements of topsoil or routine deep ploughing

Figure 1.2 View of the Kazanlak Valley looking westwards, with the Sredna Gora on the left and the Stara Planina on the right.

Figure 1.3 View of the southern Thracian Plain looking south towards Dodoparon, with a group of burial mounds in lower right.

(but see below). Finally, once good working relationships were established with our Bulgarian colleagues, and the appropriate permits acquired, Bulgarian regulations offered few of the arbitrary restrictions on survey that have been adopted elsewhere (*e.g.*, limitations on the area surveyed or time spent in the field, or mandatory artefact collection policies), and access to private property was unproblematic.

Surface artefacts were, of course, subject to a range of disturbances that complicate their relationship with subsurface remains and the ancient activities they represent. Artefacts were subject to movement and dispersal by erosion and agriculture, especially the routine practice of harrowing fields with disc or tine harrows. Survey teams witnessed occasions where ploughing brought artefacts to the surface, but subsequent harrowing dragged artefacts to the edges of fields, where they were dropped when the harrow was turned sharply or raised. Agricultural practices also damage subsurface remains and exacerbate erosion. We saw few attempts to mitigate erosion through the use of no-till or low-till cultivation, contour ploughing, or leaving crop residues on the surface of unplanted fields over the winter. Erosion in agricultural areas on hilly terrain often distributed artefacts over a large area. Ploughing was more aggressive than typical in modern agriculture in, for example, the United States (although less aggressive than we have seen in, *e.g.*, Italy, as it was limited at the time in Bulgaria by the use of older, less powerful equipment). Typical plough depths were about 30–50 cm, although excavations revealed the (rare) use of deep ploughing in the past to a depth of over a metre, disrupting subsurface remains (see Chapters 8 and 14). Conversion of pasture to arable agriculture already represents a threat to cultural heritage (Eftimoski *et al.* 2017); if these aggressive ploughing practices continue as more powerful agricultural equipment is introduced, damage to the archaeological record could become severe.

1.4 Approach

This volume maps the archaeological remains and studies the ways that people have lived in and utilised the Kazanlak Valley and the Thracian Plain in the past. Pedestrian surface survey was the primary method of investigation. Correlation between surface scatters and buried features was explored through magnetometry (where possible) and test excavations (Nekhrizov and Tzvetkova 2010; Bozhinova 2010). The ancient environment in both regions was studied through palaeoecology, especially the palynological analysis of lake and wetland samples. All of these methods were combined to arrive at a picture of ancient habitation patterns, lifeways, and interactions between people and their landscape.

The leaders of the TRAP project are, essentially, processual in their approach to archaeology. Our interests reside in documenting and understanding long-term cultural change in its environmental context. As originally articulated, the project was, as is often the case with processual research, 'method-oriented rather than problem-oriented' (Hole 1973, 20). TRAP initially sought to apply a combination of proven methods (total-coverage pedestrian surface survey, satellite remote sensing, geophysics, test excavations) to fundamental research (*e.g.*, the mapping and evaluation of archaeological landscapes) in areas where they had been underutilised in the past, due to language barriers and (prior to 1989) political isolation, or due to a lack of local resources in the transitional economy of a lower-middle income country. The project's innovation would lie in the rigorous integration of archaeological and palaeoenvironmental approaches, and the marriage of local expertise with international perspectives.

Since the beginning of the project, we have grown more determined to formulate and explore testable hypotheses about environmental change, the evolution of complexity, and the interaction of the two. The consensus of the contributors was, however, that this volume would report and analyse the data generated by fieldwork, and so these hypotheses have been presented and evaluated in standalone articles (see Sobotkova 2012; 2013; 2016; Connor *et al.* 2013).

Producing a comprehensive and reusable dataset has been a major goal from the beginning. Starting with

our pilot project in 2008, we experimented with digital field recording (Ross *et al.* 2010) and implemented daily digitisation of whatever we could not record digitally. Survey data (archaeological and geochemical) were consolidated, reviewed, and analysed using an ARCGIS geodatabase, while artefact data were recorded in spreadsheets (later cleaned and reorganised using Open Refine). To the greatest extent possible, we have sought to distinguish data from interpretation, publishing the former digitally so that our interpretations can be reassessed, confirmed, extended, and challenged. While the line between data and interpretation may not always be clear, we nonetheless believe that it is useful, for example, to publish all raw surface artefact counts, separate from any corrections for age or visibility applied to them and, especially, separate from our site boundary definitions. Others can, as a result, reanalyse our artefact count dataset, applying their own corrections and site definitions. Our other datasets also contain data in the rawest form we could provide, and are accompanied by metadata that should help make them more useful to others.

The presentation, contextualisation, and analyses of these results constitutes the bulk of this volume. Such analyses include the quantification and critical evaluation of the survey data (Chapters 8, 9, 14, and 15) and a spatial analysis of changing site distribution patterns, including population growth and nucleation (Chapters 10 and 16). Geoarchaeological modelling of erosion in the Kazanlak Valley (Chapter 7) assists the interpretation of surface finds. Specialist studies also illuminate Bronze Age palaeodiet through isotopic analysis (Chapter 17), assess changes in consumption in the Late Iron Age through study of transport amphorae (Chapter 20), and evaluate elite self-presentation in surviving inscriptions from the Late Iron Age and Roman era (Chapter 21).

1.5 Outcomes

Looking back at the six aims we set out in our original ARC grant application at the inception of the project, this Final Report substantially achieves Aim 1 (locate and inventory previously unknown archaeological sites and features), Aim 3 (reconstruct environmental change since the end of the last ice age), Aim 4 (assess settlement patterns, productive strategies, and the concomitant rise of and interactions between complex societies), and Aim 5 (evaluate and explain environmental and agricultural trajectories over the long term). We have inventoried some 100 flat sites and 1,000 burial mounds across the two study areas (Sobotkova *et al.* 2010; Nekhrizov *et al.* 2011; Sobotkova 2012; Iliev *et al.* 2012). We have produced a palaeoecological record extending back over 30,000 years, and have begun to combine these two datasets with legacy information to produce an original interpretation of evolving settlement and subsistence patterns (Connor *et al.* 2013). While this volume is not the last word on any of these research areas, and further fieldwork and analysis will extend what we have done, we present here our extensive datasets and provisional interpretations related to these aims.

Aim 6 (develop site location models and comprehensive cultural heritage management plans) is partially complete, although published separately. All our results (boundaries of artefact scatters; locations of all burial mounds) have been reported to the Archaeological Map of Bulgaria (AKB), the official site registry for Bulgaria, for use in cultural heritage management. Regarding site location modelling, our datasets of settlements have proven to be too small for rigorous statistical analysis against the full range of environmental (let alone cultural) factors. Mound datasets, while larger, are crippled by the lack of chronological control – mounds were constructed across more than 2000 years, but most cannot be dated, inhibiting meaningful site location modelling. Our dataset of mounds from the Kazanlak Valley was, however, large enough to undertake a novel statistical analysis to assess threats to this class of monument. It was designed by an undergraduate economics student who joined us in 2011, again proving the worth of the Mobility Program grant. This risk assessment was published in the *Journal of Cultural Heritage* (Eftimoski *et al.* 2017). In 2017, Sobotkova also undertook additional mound registration in the Yambol province, one outcome of which was the production of a large enough dataset to perform similar threat assessments there.

Aim 2 (evaluate the effectiveness of satellite remote sensing for detecting small-scale archaeological sites) is still in progress. We understaffed this activity during fieldwork, and completing it from the information we have now still requires time-consuming, manual processing of our remote sensing, pedestrian survey, and ground control datasets – something that would have delayed the publication of this volume unacceptably. We have, however, compiled a valuable dataset of over 1,000 satellite image features and their ground control results that will help other archaeologists interpret similar features in other Mediterranean and transitional Mediterranean-Continental zones. This dataset, and the accompanying assessment of satellite remote sensing recovery rates for small sites, will be published separately.

Overall, we consider this project a success. We met four of six aims and partially achieved the remaining two, despite considerable difficulty establishing the project and modification to the research design. We particularly hope that the publication of comprehensive, digital datasets enhances the value of our work. Since the conclusion of TRAP fieldwork, and partly inspired by it, Ross and Sobotkova and have built a major archaeological e-research infrastructure initiative, the Field Acquired Information Management Systems (FAIMS) Project, now based at Macquarie University, Sydney, Australia (http:/ /www.faims.edu.au/). This project developed and maintains a customisable field data collection framework that is interoperable with other archaeological data

services and repositories. As such, we have attempted to set an example for good-practice publication of our data through one of our partner organisations, Open Context. Oxbow Books has been enthusiastic about this exploration of a hybrid publication, a 'traditional' report (minus most of the printed catalogue) plus online datasets. It is hoped others find these data informative, and that they reuse and repurpose them to extend and refine our interpretations.

1.6 A guide to this volume

This Final Report is divided into four parts: Part I (Chapters 1–4) establishes the historical and methodological context of the project, introducing the history of survey archaeology in Bulgaria and explaining the survey methods and scientific methods employed by TRAP. Part II (Chapters 5–10) presents results from Kazanlak, while Part III (Chapters 11–16) presents results from Yambol. Each of these parts is structured similarly, first discussing the topography and environment, then moving on to the history of archaeological research in the area, before presenting the results of environmental investigations and surface survey, and finishing with two analytical chapters, one examining habitation and another interpreting the survey results in their environmental context. The only significant structural difference between Part II (Kazanlak) and Part III (Yambol) is the nature of environmental investigation (geoarchaeology for Kazanlak, palaeoecology for Yambol). Part IV (Chapters 17–21) contains ancillary studies: excavations at Stroyno-Yurta and Dodoparon in Yambol, an analysis of imported Classical and Hellenistic amphorae in the Yambol province, and an exploration of the Classical, Hellenistic, and Roman epigraphy of both Kazanlak and Yambol.

This volume is accompanied by a Digital Supplement housed in Open Context (the TRAP Digital Archive).[1] The supplement contains comprehensive digital datasets (replacing a traditional printed catalogue), photographs, examples of blank recording forms, scans of completed forms, and other items that extend or contextualise this text. Digital datasets include: survey units, artefact concentrations, 'flat' sites, burial mounds, survey artefacts, and data specific to specialist studies included in the volume.

Note

1 DOI: https://doi.org/10.6078/M7TD9VD3

2

Surface surveys and the Archaeological Map of Bulgaria

Georgi Nekhrizov

Abstract *Archaeological surface surveys in Bulgaria have evolved greatly since their commencement in 1878. Individual archaeologists, organisations, and institutions made important contributions to the creation of a comprehensive map of Bulgarian archaeological heritage. Survey methodology has become more sophisticated as innovative research methods have been adopted. A key moment was the establishment of the Automated Information System 'Archaeological Map of Bulgaria' (AIS AKB), the official Bulgarian archaeological site register, in 1990. The accompanying laws and regulations provided a legal framework governing the operation and use of the AKB, but also establishing the principles that guide archaeological fieldwork in Bulgaria. Subsequently improved, the AKB now offers online access to a database of Bulgarian archaeology, facilitating collaboration between researchers and cultural heritage practitioners in Bulgaria.*

Keywords *history of archaeology; archaeological methods; surface survey; archaeological mapping; cultural heritage registers; archaeology data services*

2.1 The Archaeological Map of Bulgaria

The process of surveying, recording, and publishing archaeological monuments in Bulgaria has almost 150 years of history following the establishment of the new Bulgarian state after 1878. In its early years as a young Slavic state which emerged in the Balkans, the Czech citizens of the Austro-Hungarian Empire were mostly the first who, driven by the idea of the Pan-Slavism, provided missing intellectual leadership in Bulgaria. Interest in the archaeological legacy of Bulgarian lands began with Felix Kanitz and especially Konstantin Jireček (Kanitz 1882; Jireček 1974; 1978). During their years of devoted work and travel in Bulgaria they collected valuable data and provided some of the first scholarly overviews of Bulgarian ethnography, archaeology, demography, language, and geography.

Besides Kanitz's and Jireček's contributions, credit for the establishment of archaeology in Bulgaria belongs to the Škorpil brothers, another two Czechs. In numerous studies, the brothers described hundreds of archaeological sites, sometimes with corresponding drawings (Škorpil and Škorpil 1885; 1888; 1891; 1892; 1898; Škorpil 1912; 1914). Even today their results are still relevant, providing information for some monuments which no longer exist, like dolmens, mounds, or fortresses. The Škorpils' studies represent an example of a responsible attitude towards the past and concern for antiquities.

The work of the early Austro-Hungarian researchers was carried on by the Bulgarian archaeologists, who considered mapping archaeological heritage as their main task. Most of them, being much more enthusiastic patriots than foreign-educated archaeologists, organised local archaeological societies in some major towns. At a national conference of the archaeological societies in 1913, some principles and the methodological framework for producing a comprehensive 'Archaeological Map of Bulgaria' were established (Gospodinov 1914). The task of collecting archaeological data was assigned to the existing archaeological societies. Interviewing local informants using special questionnaires and recording information about the presence of antiquities around a given village served as the basic approach to cataloguing antiquities. A delegation of one or two people would subsequently visit the remains identified by locals for verification of the information, and finally map them with an appropriate symbol corresponding to site type, drawn from a prescribed list. The site list was not very systematically organised. For example, archaeological sites like 'gradishte', *i.e.* fortresses, unearthed mounds, excavated mounds, or

mounds with cremation co-existed with mammoth bones, or arbitrary special finds like maces (Gospodinov 1914, 39–41). To facilitate data collection, Atanas Ishirkov, a Professor in Geography and Ethnographic studies at the Sofia University, published short instructions addressing settlement studies (Ishirkov 1914).

As a result, between 1914 and 1963 a monographic series, *Material for the Archaeological Map of Bulgaria* was issued. Numerous new archaeological sites were catalogued and published thanks to the important contributions of leading Bulgarian archaeologists and historians of that time (Mutafchiev 1915; Popov 1920; Velkov 1927; Mikov 1933a; Venedikov 1943; Filov 1993).

During the 1950s more centralised and standardised approaches were introduced. Dimitar Tsonchev, one of the leading archaeologists and Director of the Plovdiv Archaeological Museum, provided a short overview with instructions for archaeologists and local researchers creating archaeological maps of specific regions (Tsonchev 1956). In this overview, the National Institute of Archaeology at the Bulgarian Academy of Sciences (NIAM-BAS) was identified as the organisation responsible for establishing a uniform research system. The investigations themselves were conceived of as deliberately planned scientific work that could include trial or large-scale excavations, or just fieldwalking. Tsonchev strongly recommended thorough preparation for field research, during which the study area was clearly defined, an appropriate team of researchers including specialists for every chronological period was assembled, and research using earlier reports and unpublished finds was completed. Special attention was paid to obtaining a topographical map and ensuring that the research team had sufficient cartographic experience and ability. Alongside recommendations for necessary supplies, such as cameras, scales, pencils, booklets, *etc*., Tsonchev suggested the spring and autumn months as the most suitable for conducting survey, due to lower vegetation and better surface visibility.

Thanks to the tireless work of two generations of Bulgarian archaeologists, by the 1970s a significant amount of information about archaeological sites had been collected. Unfortunately, a large part of it is still unpublished. Considering the diversity and richness of Bulgaria's archaeology, relatively few attempts to synthesise the archaeological legacy of specific regions were produced (Stefanov 1956; Tsonchev 1956; Balkanski 1965; Vazharova 1965; Detev *et al.* 1966; Aladzhov 1974; 1997; Bobcheva 1976; Balkanski 1978a; 1978b). In this period some regional studies were published that treated the ancient surface remains in a broader historical-geographical context (Deliradev 1953; Batakliev 1969).

During the 1970s, together with the Archaeological Institute, another important institution created for cultural preservation was the National Institute for Monument of Culture (NIMC). Besides pre-modern and modern architectural monuments, the experts working there set a special value on archaeological sites. In collaboration with specialists at the regional museums, archaeologists from the NIMC published catalogues of the archaeological monuments for several Bulgarian provinces. Such inventories were prepared for Shumen (Dremsizova-Nelchinova and Antonova 1975), Kyustendil (Dremsizova-Nelchinova and Slokoska 1978), Yambol (Dimitrova and Popov 1978), Pleven (Mitova-Dzhonova 1979), Pernik (Mitova-Dzhonova 1983), Ruse (Dremsizova-Nelchinova and Ivanov 1983), Vratsa (Dimitrova 1985), Blagoevgrad (Dremsizova-Nelchinova 1987), and Targovishte (Dremsizova-Nelchinova *et al.* 1991). These publications summarise large-scale information about different archaeological sites in each region, listed according to the internal administrative divisions of the municipalities, thus building an official register of the archaeological legacy for its preservation. In most cases, the information provided was not systematically collected through surface study, but instead relied on archival information or previous publications. Each surface survey itself was assigned to an individual researcher, who was responsible for a given administrative province often covering an area of thousands of square kilometres. As a result, in many cases, site descriptions were incomplete, site location or boundaries were lacking, and discussion of the geography, history, or cultural importance of the region was missing.

In 1972, the new Institute of Thracology at the Bulgarian Academy of Sciences appeared as another institution responsible for the study of the Thracian culture. Expeditions organised during the 1970s by the Institute of Thracology and the Archaeological Institute, in collaboration with local museums, contributed to increasing our knowledge about the archaeological legacy. They focused on some less-investigated areas: the mountainous regions of Strandzha, Sakar, and the Rhodopes (Panayotov *et al.* 1976; Venedikov and Fol 1976; Fol 1982), the course of the Mesta River (Domaradzki *et al.* 1999), plus smaller, neglected provinces (Georgieva *et al.* 1983). The investigations, however, were often non-systematic, targeting sites of a specific type, like megalithic monuments, or specific chronological eras, especially the Thracian period. The names adopted for the expeditions illustrate that sort of subjectivism: the 'Bessica-Expedition' in the Rhodope Mountains after the Thracian tribe Bessi, allegedly located there (Panayotov *et al.* 1976);[1] the 'Apollonia-Strandzha Expedition' or the 'Mesambria-Hem Expedition' as part of 'Thracia Pontica', a newly introduced term for the ancient coastal Thracian lands (Fol 1982, 15). The methodological framework of the surface surveys was never widely discussed in the resulting publications, but obviously the sites were identified based either on legacy information or (again) on interviews with local informants. This approach was practised widely, but it failed to produce a comprehensive picture of Bulgarian

archaeological heritage. Despite this, the expeditions of the Institute of Thracology led to the popularisation of the surface survey as a separate research method, parallel to excavation.

The disadvantages of these approaches were already apparent by the time of the Mesta Expedition, guided by Mieczysław Domaradzki between 1975 and 1979, since a lot of the archaeological sites, being unknown to the local residents, were overlooked. In the last year of that survey, a new methodology was introduced for more systematic investigation of all geomorphological areas suitable for habitation (Domaradzki 1980; Domaradzki *et al.* 1999, 7; *cf.* Kulov 2009, 16). The methodology for intensive survey was well established elsewhere in the Mediterranean (*cf.* Kecheva 2014, 2), but since Bulgaria was then behind the Iron Curtain, new ideas from countries outside the Eastern Bloc were lacking.

A special role for the elaboration and popularisation of this systematic approach was played by Domaradzki. A Polish archaeologist, he came to Sofia in 1973 where he completed his PhD thesis at the Institute of Thracology. He spent most of his life in Bulgaria, devoted to the study of Thracian culture, and uncovering different aspects of settlement life, cult places, and cultural contacts. With his energy, enthusiasm, and studious attitude, he inspired many colleagues and young scholars, thus creating a large network of collaborators. Acquainted with the methodological framework governing the Archaeological Map of Poland (*cf.* Kobyliński 2014, 227), as well as relevant methodologies used in British fieldwork (*cf.* Domaradzki 1980, 29, n. 5–7), Domaradzki made a major contribution to Bulgarian archaeology by shaping the modern incarnation of the Archaeological Map of Bulgaria. Bulgarian approaches, and data accumulated to date, provided an essential core for the AKB, but there was also a need for more sophisticated surface survey methods that Domaradzki addressed.

The first step in this course initiated by Domaradzki was a Bulgarian-Polish archaeological expedition between 1978 and 1982, focused on the study of the Middle Struma Valley. One of its main objectives was the application of total surface coverage techniques, producing an exhaustive archaeological map of the region under study (Domaradzki *et al.* 2001; Gergova 2009). The field organisation included working in larger groups of 10–12 people. Three different surveying approaches were deployed depending upon the terrain: (1) in hilly regions, extensive survey covering of all slopes; (2) in steep mountains, directed according to the information of residents; (3) in river valleys, total coverage. A second stage of site exploration involving trial excavations was also envisaged (Domaradzki 1980, 30f.).

During the expedition, the Strumeshnitsa River valley was fully investigated, including parts of the southern slopes of the Ograzhden Mountains. The advantages of this methodology became obvious with the first analysis. After 70 days of fieldwork, it covered an area of 840 sq km with 1,800 sites registered. By comparison, the Mesta Expedition registered only 186 sites in a 561 sq km area. With this success, the methodology needed no further justification (Gergova 2009, 26). The approach would later become the preferred surveying technique, though its application in the field spread only slowly (Kulov 2009, 17–20; Nekhrizov 2009, 124).

Besides the improvement of the surface coverage techniques, another issue became obvious during the Struma Expedition: the lack of a unified terminology for site description (Domaradzki 2001, 6). For its elaboration, a plethora of available archaeological data had to be considered, which required wider collaboration between different specialists. Meanwhile, political events in Poland led to the breakup of the Expedition in 1982.

It took a little while for the work on the Archaeological Map of Bulgaria to be renewed. In 1988, again under the supervision of Domaradzki, a special working group was created at NIAM-BAS. It included a range of specialists: archaeologists from NIAM-BAS, NIMC, and the museums, as well as geographers and IT specialists. The main tasks of the group during the next two years of intense work were focused on creating a general framework for modern, digital registration of archaeological sites in Bulgaria, called the Automated Information System 'Archaeological Map of Bulgaria' (AIS 'AKB', or simply AKB, using the Bulgarian acronym for Археологическа карта на България/*Arkheologicheska Karta na Balgariya*). The final conceptual framework included:

- Establishing a permanent organisational structure for coordinating the AKB within the NIAM-BAS.
- Determining the methodological principles for gathering and processing data about archaeological sites and monuments for submission to the AKB.
- Estimating the extent of Bulgarian archaeological heritage based on existing knowledge. According to the data provided by museums, known sites numbered about 25,000 in 1988, while their total number was estimated between 100,000 and 120,000. The latter figures were extrapolated from site concentration in well-studied regions, extending to the whole of Bulgaria.
- Organising courses and workshops for training archaeologists, in order to standardise methodology. Ultimately, most Bulgarian archaeologists participated.
- Producing vocabularies and thesauri to reconcile terminology for archaeological site types, features, and finds, chronological and cultural categories, for geological, geographic, and topographic features, administrative divisions, and other necessary concepts. The resulting vocabularies informed software design and the instructions for submitting data.
- Developing custom software for an online registry.

The first DOS version of the AKB software was ready for use by the end of 1990, along with registry cards and guidelines for completing them.

Thus, after 1913 and the first introduction in public of the idea for an Archaeological Map of Bulgaria, the enterprise evolved into its now sophisticated and structured shape. It involved a nationwide effort for the AKB to become a real database, but while it was being designed and built, the end of the Communist era drove Bulgaria into a long period of political transition, which also affected the attitude towards the archaeological monuments.

One event in particular contributed to the initial populating of the new AKB. Beginning in 1991, a program of land restitution was implemented across the country. This undertaking required defining the protection status of archaeological sites lying within associated agricultural lands. The AKB Working Group and Bulgarian archaeologists focused on the protection of this heritage. An appointed archaeologist in every municipality provided the location and borders of all known archaeological sites. In all, 116 archaeologists from across Bulgaria participated in the campaign. For six months, from September 1992 until April 1993, data for thousands of archaeological sites was collected and entered into the AKB, along with the suggested land-use restrictions within site boundaries. After this large-scale campaign, the AKB contained records for 13,374 archaeological sites (Domaradzki 2005; 1994b).

Thus, the AKB not only met scientific needs, but also served as a national register for protection of archaeological monuments. This status demanded that the AKB receive legal status. For the elaboration of the necessary legal framework governing its use and administration, another working group was established by the Ministry of Culture, consisting of archaeologists and lawyers led by Georgi Nekhrizov. This working group drafted the ordinances for the AKB, which were officially published in 1996 by the Ministry of Culture. This framework regulates the procedures for populating the database, establishes author's rights and levels of access for different users, and defines how the maintenance and development of the AKB is managed and financed (State Gazette no. 34 from 23.04.1996). Later the working group also prepared regulations governing how to conduct archaeological investigations in Bulgaria, defining clear rules for excavation and systematic surface survey (State Gazette no. 12 from 7.02.1997, p. 14).

During the second half of the 1990s, economic stagnation in Bulgaria and concomitant budgetary limitations severely restricted AKB-related activities. Surface archaeological investigations were limited. It became impossible to conduct methodology workshops or to hold periodic national meetings of archaeologists contributing to the AKB. Rescue projects represented one of the few ways that surveys could continue, contributing to the AKB. During that period, surface surveys and excavations were carried out annually but only on endangered sites.

At the same time, work to improve the AKB continued. The DOS version caused serious difficulties in data exchange and report preparation. In early 2000, a new version that ran under the Windows operating system was released. The Windows version was then implemented in all museums, greatly facilitating the work of collecting and processing data. Together with the release of the new Windows version, an audit of all paper registry cards submitted to the AKB was conducted to eliminate some duplicated registry cards (Nekhrizov 2009, 11).

Another AKB sub-project supervised by Domaradzki was the creation of a system to document excavation results. The excavations of the site Emporion Pistiros near the town of Vetren, Septemvri municipality, were chosen as a test-bed for this work. Unfortunately, the sudden death of Domaradzki in 1998 precluded the completion of that task. The absence of Domaradzki, the main author of the AKB concept, was a major loss not only for the enterprise, but also for Bulgarian archaeology more generally.

To recognise to the work of Domaradzki, in the autumn of 1999 an international symposium dedicated to his memory was held in Kazanlak. The symposium included a roundtable discussion of the AKB, including problems, results, and future directions. All the participants – Domaradzki's co-workers and pupils – credited him for establishing the AKB; he had dedicated ten of the most prolific years of his life to the realisation of this idea (*cf.* Nekhrizov 2005).

By the late 1990s to early 2000s, archaeological surface survey was becoming more systematic and more driven by technology. The field methods for total-coverage techniques recommended by the AKB became the common approach. In addition, the application of GPS locations to sites and finds was introduced. Several international projects were also undertaken that explicitly sought to clarify regional settlement dynamics (Lichardus *et al.* 2000; Chankowski *et al.* 2001; 2004; Conrad 2006, 309–11; Krauß 2006, 145). The Bulgarian-French investigations of the territory around Emporion Pistiros in 2000, for example, instituted the application of intensive coverage and an experimental methodology for site recording. At the site of Izvora near Belovo village, the terrain was divided into contiguous survey units, with all visible surface artefacts counted in each. Zones with higher concentrations were identified, site borders were defined, and the location of subsequent trial excavations delineated (Nekhrizov 2006, 179–81). Similar full-coverage approaches were applied by the Bulgarian-British expedition investigating settlements in the territories of Nicopolis and Istrum during 1998–2002. The latter were the first investigations in Bulgaria to apply GIS software for post-processing of results (Poulter 2007, 587–94).

An essential moment in the history of the AKB was a national conference in Blagoevgrad held during October 2007, dedicated to the problems faced by archaeological surface surveys. The overview of the work on AKB for the years 2000–2007 drew out several trends: the growth of surface survey, led by young and professional archaeologists, sat in opposition to the slow growth of data in the AKB, so till the end of 2006 the number of the registry cards was ca. 14,100 (Nekhrizov 2009, 11). A possibility for overcoming these problems was further development of the software, allowing the upload of digital maps and accommodating GPS coordinates and GIS integration, which was one of the most important decisions taken at the conference (Kulov, Komitova, and Grębska-Kulova 2009, 187).

Based on the requirements expressed at the Blagoevgrad conference, the AKB was redeveloped as a web service. After extensive testing, a production version was released in May 2010. Its main advantages included: online access; granular access control based on each user's identity; precise spatial information about sites and site borders; additional capacity for entering information about features and finds (including images and illustrations); improved visualisation of maps and site plans; better synchronisation of new information; faster and simpler editing of existing site records; full-text search operations; simplified system administration; and improved security. The new system prevents registry cards from being submitted until required data are entered, enforcing minimum data and metadata standards. A new function also allows the approval of new records by a regional administrator. Review by a person familiar with the region enhances the quality and accuracy of information in the system. Ongoing development includes the implementation of a GIS within the AKB.

In recent years, several survey projects have further refined systematic survey through the application of GIS and mobile computing technologies, increasing the efficiency of survey and contributing to the production of more comprehensiveness datasets for the regions under study. In most cases, foreign specialists provided equipment, software, georeferenced topographical maps and satellite imagery, and technical expertise. The pioneering place in these mobile GIS-aided surveys belongs to the collaboration of Bulgarian and foreign specialists in the Tundzha Regional Archaeology Project (TRAP) survey discussed in this volume (*cf.* Ross *et al.* 2010; Sobotkova *et al.* 2010; Nekhrizov *et al.* 2011; Iliev *et al.* 2012).

The advantages of precise recording using mobile devices with mapping applications, and gathering plenty of verified field data, were quickly realised by many Bulgarian archaeologists. Mobile GIS applications were immediately adopted for rescue archaeology associated with infrastructure projects. During 2011–2013, the Nabucco and South Stream gas pipeline assessment projects were carried out by Bulgarian archaeologists according to these best practices (Nekhrizov 2012; Tzvetkova *et al.* 2012). Such practices have proven their effectiveness and are now being applied to planned research surveys in addition to infrastructure mitigation projects (Georgiev *et al.* 2011; Leshtakov *et al.* 2012; Nekhrizov and Cholakov 2012; Nekhrizov *et al.* 2012; Aladzhov *et al.* 2013; Dumanov *et al.* 2013; Tzochev and Nankov 2014; Kecheva and Tzvetkova 2015).

As elsewhere, new remote sensing technologies are transforming archaeology in Bulgaria. Satellite remote sensing using high-resolution multi-spectral imagery has been used to extend pedestrian surface survey (Sobotkova and Ross, 2010). LiDAR, with its ability to strip vegetation, is starting to be used to create digital terrain models, facilitating surface studies in densely forested regions (Tcherkezova *et al.* 2014). The Centre for Underwater Archaeology in Sozopol has also applied LiDAR to underwater archaeological research (Popov *et al.* 2011; Prahov *et al.* 2011; Vaysov *et al.* 2013). While appearing expensive, such techniques are often less costly than time and labour-intensive manual studies.

The AKB, with its digital information about archaeological sites in Bulgaria, has facilitated international collaboration. In 2013, NIAM-BAS and the AKB joined the international Advanced Research Infrastructure for Archaeological Dataset Networking in Europe (ARIADNE) project, funded by the European Commission under the Community's Seventh Framework Program. It involves 24 partners from scientific and technical organisations representing 16 European countries. The project aims to integrate existing archaeological research data infrastructures to overcome the fragmentation of digital datasets, variations in terminology, and the unavailability of unpublished fieldwork results. Creating common portals to data repositories will encourage the sharing of data across academic and administrative fields, enhancing archaeological research across Europe.

In its modern incarnation, the Archaeological Map of Bulgaria has existed for more than 25 years. During that time, the AKB has proven its worth, both in terms of protection of the archaeological heritage of Bulgaria, and as a valuable research database. The AKB comprises the most comprehensive record of Bulgarian archaeological heritage available. As of 30 June 2015, the database contains records of some 18,600 archaeological sites. Today the AKB is a legally recognised entity, a fundamental component of the apparatus protecting archaeological heritage. The AKB is one of the most important information sources for preparing Environmental Impact Assessments. AKB reports are used by archaeologists from different government or research institutions to bolster legal arguments for permitting or preventing plans for development. Such reports are required for investigations and pre-trial proceedings regarding illegal treasure-hunting activity or other violations of the integrity of archaeological monuments. AKB reports are used by

cadastral offices, land committees, forest services, and various municipal departments to guide their activities and preserve the integrity of Bulgaria's archaeological record. In addition to its undisputed role as the definitive source of information for archaeological heritage protection, the AKB represents an extremely valuable scientific resource. The database is used by researchers at NIAM-BAS, Bulgarian universities, regional museums, and our foreign colleagues. The information contained in the AKB, forms the basis for many MA and PhD theses, improving archaeological research training. It provides data for local and regional landscape analyses, investigations of artefact types, and research about cultural development in specific chronological periods. As such, it has opened new opportunities for large-scale regional and synthetic research on Bulgarian lands through the ages.

Note

1 Recent studies suggest another location for the tribal territory of the Thracian Bessi, north of the Rila and Rhodope Mountains and extending west to the Upper Strymon Valley (Delev 2012).

3

Survey methodology

Adela Sobotkova and Shawn Ross

Abstract *The survey methods used by the Tundzha Regional Archaeology Project (TRAP) in both the Kazanlak and the Yambol study areas included intensive, extensive, and 'adverse terrain' survey. TRAP adopted this combination of methods to accurately and systematically document survey coverage across variable terrain. More specifically, these methods allowed us to survey a contiguous area, document surface distributions of archaeological material, and monitor survey intensity despite changing land cover and accessibility. A 'site record' was produced immediately in the field for readily identifiable features such as forts or burial mounds. Surface distributions of artefacts were interpreted into 'sites' post-facto with the help of GIS and pottery analysis. Spatial coverage of survey teams was documented digitally in the field, while associated environmental and archaeological data were recorded on paper forms for daily digitisation.*

Keywords *survey methods; systematic pedestrian survey; total coverage; site definition*

3.1 Introduction

Informal site-based surface survey has a long tradition in Bulgaria as a tool for site discovery and mapping (see Chapter 2 and Chapter 6). The 1980s, 1990s, and 2000s witnessed significant efforts to formalise survey methods and raise the status of survey as an independent research method (Domaradzki 1980; 1982; 1994b; Nekhrizov 2005). Today, survey is practised widely in Bulgaria. As is the case elsewhere, its methods and interpretive frameworks vary, as do the quality and consistency of results. Some regions, such as the Struma River, offer rich diachronic datasets (Grebska-Kulowa and Kulow 2007), while in other regions only specific periods or sites have been purposefully explored (Delev 1982a; Vulcheva 1992; Gotsev 1997a). Furthermore, existing survey data rarely serve as a basis for analysis and interpretation; follow-up studies are more the exception than the rule (Gaydarska 2007). The primary purpose of survey remains the cataloguing of sites for cultural heritage monitoring (Dimitrova 1985), or for excavation (Gotsev 1997a; Chankowski and Gotsev 2002; Panayotov *et al.* 1991; 1995; Borisov 1994). The potential for survey data to address questions of long-term settlement evolution (Adams 1965; Cherry, Davis and Mantzourani 1991, 18; Jameson *et al.* 1993), demographic modelling (Fentress 2009; Drennan *et al.* 2015; Ammerman 1981), social structure, landholding, and environmental exploitation (Drennan and Dai 2010; Bintliff 1982; van Andel and Runnels 1987; Vita-Finzi and Higgs 1970) remains underexplored. As a step towards changing this situation, the Tundzha Regional Archaeological Project (TRAP) has produced a systematic and consistent dataset that can address a range of research questions related to the evolution of settlement patterns in inland Thrace. In so doing, we hope to underscore the importance of survey in Bulgaria as an independent research method that can contribute to broader scholarly discourse about the human past.

Overall, the strategy of field walking and documentation utilised by TRAP was influenced by 'artefactual' survey methods developed by the Dutch in the Murge region of the Salentine Peninsula in Italy (Burgers 1998; 2001), survey in Boeotia (Bintliff and Snodgrass 1985), and survey in Central Bohemia (Neústupný 1998). The approaches were tested and adapted to local conditions during the 2008 pilot project in Yambol (Ross *et al.* 2010).

This chapter presents the three principal survey methods and interpretive processes that arose from the pilot season and were implemented over the following three years of fieldwork. These methods ultimately led to the creation of the datasets presented in Chapters 8–10 and

14–16. The default survey strategy consisted of 'intensive' survey of closely spaced teams of walkers continuously examining the landscape. More extensive and flexible methods were used where surface visibility was poor, or the terrain difficult. In all cases, field walkers recorded spatial coverage and organised surface observations and grab samples by means of arbitrary containers, called 'survey units'. Environmental conditions and surface artefact counts formed the core of the data, together with grab samples of diagnostic artefacts. Survey was 'total-coverage' in that these survey units were contiguous, and all manmade artefacts and features, including 'nulls' (units with no artefacts or only background scatter) were recorded. These continuous data on surface artefact distribution provided the basis for the later interpretation of surface concentrations and sites. To facilitate data reuse and reinterpretation, all unit-level records of raw surface artefact count and environmental conditions have been digitised and are included in the accompanying datasets.

3.2 TRAP survey design and rationale

TRAP used total-coverage pedestrian survey to examine the Kazanlak Valley and two areas of the Yambol province systematically (*cf.* Fish and Kowalewski 1990). In each area we selected contiguous blocks of land where the topography and environment provided some coherence: an enclosed intermontane valley in the case of the Kazanlak study area and a ridgeline bounded by two tributary streams of the Tundzha River in the Elhovo study area (*cf.* Chapters 5 and 11). All the accessible parts of those contiguous blocks were then walked and recorded. This choice was informed by Kent Flannery's (1976, 132) suggestion: 'If you can survey your entire region metre by metre, do so in preference to sampling'. During survey, teams walked across fields and monitored their progress and coverage, noting environmental conditions, and recording cultural remains visible on the surface, including both artefacts and features like burial mounds (a standard approach to total-coverage survey in the Mediterranean and elsewhere (*cf.* Alcock, Cherry and Davis 1994, 137–8; Bintliff and Snodgrass 1985; Gallant 1986, 418; Kuna 1998). This continuous coverage method was chosen for three principal reasons:

1. to fill in the space between the known sites as both areas have a history of site-centred archaeological investigations;
2. to understand the evolving spatial distribution of past cultural residues (and, by extension, past activity) within our study areas from the first sedentary societies to the pre-modern period; and
3. to establish the context of significant archaeological sites, such as Seuthopolis in Kazanlak, and Stroyno-Yurta and Dodoparon in Yambol, including their emergence within the history of local settlement (see Chapters 6 and 12).

Total-coverage and continuous survey was best suited to these goals because it captured a more complete picture of surface remains and minimised 'edge effects'. We expected human activities within our study areas to be spatially varied, even within the same topographic or modern land-use zone (Bintliff 2000, 201), and such differences are easier to observe without the disruption of missing data, caused by the spaces between isolated sample areas or transects. Finally, total-coverage survey with documented 'nulls' provides data about site presence as well as absence, both of which are required for the statistical and spatial analysis of settlement patterns we had envisioned.

Since the overall emphasis of TRAP surface survey was on efficient quantification of surface remains, fieldwalking methods varied according to environmental conditions (like Düring and Glatz 2015, 53–103). This decision was informed by the findings of Terrenato and Ammerman (1996), which indicate that environmental factors, especially surface visibility, determine the discoverability of artefacts (and therefore survey returns) if other aspects such as the intensity of fieldwalking are held constant. The aim was for consistent, intensive, total-coverage survey, and to achieve it efficiently. It meant focusing efforts on the fields where this sort of survey would be productive, but without ignoring the more difficult areas. The survey intensity was therefore reduced (increasing the rate of progress) in areas of low surface visibility, where artefacts could not be seen no matter how closely walkers looked, saving project time and personnel for areas where better surface visibility made intensive survey more worthwhile (see section 8.5 for 'Survey Intensity and Site Recovery in Kazanlak').

More specifically, the strategies employed included:

1. systematic intensive survey in areas of high surface visibility (>50%) and easy to moderate passability;
2. systematic extensive survey in areas of low surface visibility (<50%) and easy to moderate passability; and
3. adverse terrain survey (ATS) in areas of difficult passability.

The term 'passability' here refers to the ease of access and passage across terrain and through whatever vegetation was present; team leaders rated it subjectively on a 1–5 Likert scale, from 'easy' to 'impassable'. All survey recording forms are reproduced in the TRAP Digital Archive.[1]

During intensive survey, the landscape was recorded continuously by teams walking arbitrary, contiguous survey units. A team usually consisted of five walkers, while typical units were square, ranging in size from 75×75 to 100×100 m. Each team member would, at regular intervals equal to walker spacing, call out the type and number of artefacts encountered (*e.g.,* three tiles; one lithic; five potsherds), indicating whether this number was a raw

Figure 3.1 Field walkers prepared to survey a new field.

count or (in areas with many artefacts) a density per square metre. Walkers differentiated between ceramics, lithics, and brick/tile, distinguishing between ancient and modern where possible. Counting aloud ensured that the entire team was aware of changing densities, and provided some indication to others of the spatial distribution of artefacts across the unit under study. Further observations about the date or nature of surface remains were recorded at the unit level. Extensive survey was similar to intensive, but walker spacings were greater (typically yielding units of about 150×150 m), and instead of continuously documenting artefact counts (which was impossible due to low surface visibility), the team focused on recording conspicuous features, such as standing walls, stone features, burial mounds, and artefact scatters in pockets of higher visibility. During ATS, rather than trying to maintain a formation spread out across a landscape with difficult passability, the team followed whatever path they could through difficult terrain, recording that path and the distance clearly visible from it in either direction. Path and visibility distance were combined to determine the area visually inspected during ATS. Like extensive survey, walkers concentrated on recording conspicuous features rather than artefact counts. All methods are explained in more detail below.

A minimal collection policy applied across the entire study area. Grab samples of diagnostic artefacts were collected for follow-up analysis. The collection and analysis of diagnostics provided chronological and functional information to help interpret the artefact heat maps, which were rendered in the project's GIS every evening.

Artefact concentrations (areas where surface artefact densities were judged to be higher than the background scatter) were defined as 'sites' upon the consultation of the project GIS and the review of collected diagnostics (see 'TRAP survey interpretation' below). Artefact concentrations were revisited and resampled using a 'total-pickup' method to assess 'horizontal stratigraphy' (variability in the surface distribution of chronologically distinct groups of artefacts) and functional variability (based on differences in the types of artefacts found in different zones of the concentration). Functional and chronological interpretation of concentrations was informed by artefact analysis and, at selected sites, by geophysical investigations and trial excavations (Nekhrizov and Tzvetkova 2010; Bozhinova 2010).

Satellite remote sensing was employed to extend the area surveyed on foot (Sobotkova and Ross 2010), but is not presented in this volume (see Chapter 1).

3.3 TRAP survey interpretation

3.3.1 The problem of 'site'

Interpreting surface survey results is far from straightforward. Surface archaeological remains are a product of complex environmental and social processes. The target of survey changes with each research team. The geographic and environmental setting change from region to region. There is, therefore, no hard-and-fast rule for what defines a site. Arguments over the definition of 'site' as well as over the fieldwalking strategy arose as soon as archaeologists applied systematic surface survey as a stand-alone research method. At stake were the reproducibility of survey results, the reliability of survey data for planning rescue excavations, and the ability to compare survey results from different regions to assess settlement trends and demographic changes (Ammerman 1981).

The burning controversy that surrounded the concept of the 'site' in 1980–90s has thus somewhat abated, but the term, if used at all, is still accompanied by a careful definition in most survey volumes. The concept of 'site' first emerged from early extensive surveys in Peru, Mesopotamia, and Mesoamerica, where archaeologists documented locations of (usually visually prominent) settlements within large study areas to construct long-term regional histories (Willey 1953; Adams 1965; Flannery 1976). Later application of more intense survey methods to smaller study areas in temperate and Mediterranean landscapes brought less conspicuous, non-settlement-related archaeological residues into focus. The field of archaeological survey gradually shifted from the study of long-term settlement evolution to the study of the functional variety of human presence in the landscape. Archaeologists realised that many artefact concentrations did not represent long-term settlements, but instead indicated more ephemeral habitation, ritual, or production-related activities. In the field, a 'site' became a heuristic term for denser concentrations of surface artefacts, judged against the background scatter. The archaeologists who first embraced this shift in thinking then coined new terms to break the automatic association between 'sites' and 'long-term settlements'. New labels emerged, including 'off-sites', 'non-sites', 'place of special interest' (POSI), 'abnormal densities above background scatter' (ADABS),

and other presumably more 'neutral' terms (Bintliff and Snodgrass 1988; Davis *et al.* 1997, 401; Given *et al.* 2003; Carrete *et al.* 2005, 60).

The proliferation of labels did raise awareness about the contingent nature of the survey results. Archaeologists and historians seeking to compare multiple regions must reconcile the results of many different survey projects. The new emphasis placed on explaining methods and interpretive frameworks by field archaeologists, especially the explicit definition of 'sites' and other activity areas, facilitated such comparisons (see, for example, Alcock 1993). The new labels, however, did not entirely solve the problem of survey data comparability. Two impediments remained. First, the recoverability of surface materials depends on factors like modern surface visibility, post-depositional processes that hide or reveal remains, and the obtrusiveness of particular artefact classes, which vary from place to place but are independent of the processes archaeologists seek to study. Second, the abstraction of sites from surface materials remains subjective and reductive. Although 'ADABS', 'POSIs', and other neologisms flag the contingent nature of site interpretation, they still present only a digest of field observations, masking variability within and between sites. They represent a subset or abstraction of extant archaeological surface residues, one that cannot always be 'reverse engineered' to reveal the underlying phenomena.

Over time, survey archaeologists split into two factions. Positivists sought to combat problems with survey data comparability by increasing the intensity and precision of survey. They also quantified data where possible, and tried to characterise biases and signal interpretive decisions more explicitly (*e.g.*, Cherry 1983; Kintigh 1988; Alcock *et al.* 1994; Kuna 1995; Bintliff 1998; Burgers 1998). Sceptics, conversely, saw little return from the high cost of intensive coverage and continuous quantification, especially when the results only inform a small area and cannot be readily generalised (*e.g.*, Blanton 2001; Terrenato 2004; Fentress 2004). After a decade of debates, a middle ground emerged. Many archaeologists realised that no one method could be applied to survey, and that each region and research topic may require a tailored approach to fieldwork. The mechanical application of corrective coefficients to (*e.g.*) ground visibility, artefact age, or the productivity of particular eras has become rare. At the same time, the use of digital technology has grown, allowing surveyors to collect and publish more granular, consistent, and detailed data. Richer underlying data about surface remains can now be provided alongside interpretations like site maps. Finally, survey archaeologists have begun to employ new interpretive approaches to explore the uncertainties and interpretive biases inherent in survey datasets (Alcock and Rempel 2006; Tol 2012; Bevan *et al.* 2013; Düring and Glatz 2015).

3.3.2. The Bulgarian concept of site

In Bulgaria, most field surveys are site-based, focusing on the discovery and documentation of archaeological remains, with further investigation or monitoring in mind. The Archaeological Map of Bulgaria (AKB) defines a typology of 'sites' for archaeological heritage management.[2] The AKB uses 'site' as an umbrella term for all traces of ancient human activity in the landscape, including artefact concentrations, burial mounds, architectural remains, or 'special finds'.[3] 'Sites' are places of interest in need of protection (defined on 'site cards'), while anything that is not a 'site' is unencumbered by heritage restrictions. While this binary reduction is essential for heritage protection and management, it poses problems for archaeological research. Past human activities spanned and affected entire landscapes, and were not limited to a few hotspots surrounded by empty spaces. Even if new digital methods now encourage the mapping of site boundaries via drawn polygons or GPS point sequences, the bounding a 'site' is an inherently subjective act. Typical AKB site cards conceal subjective decisions like the density of artefacts used to define the boundary of a 'site', or what other criteria were used to determine where sites begin and end. Finally, the focus on site boundaries, while critical to heritage management, diverts attention from the internal variation of surface artefact concentrations or features, homogenising the enclosed space. AKB records and other Bulgarian survey data embody a lot of implicit knowledge that can only be learned by consulting directly with the researchers that created them. This problem makes it hard to reconcile and compare data in the AKB with other AKB records or with external datasets.

3.3.3. TRAP usage of site

TRAP agreed to use the term 'site' as per the AKB, conforming to standard Bulgarian archaeological practice. At the same time, we recorded surface artefact densities first and defined sites later. As a result, we can provide raw artefact counts and other data, so that future researchers can make their own interpretive decisions. TRAP 'sites' include the remains of past human activities ranging from long-term settlements to ephemeral 'off-site' or 'special-purpose' uses. This approach recorded the variation of surface artefacts across the landscape, whether within or outside sites, avoiding problems of reductive mapping and subjective interpretation based on (often) implicit knowledge. It thus preserved internal variation and allowed later reinterpretation of site boundaries, making the results easier to reconcile and compare with other datasets.

Sites were divided into two categories for recording and analysis: burial mounds and all other sites, especially artefact concentrations and associated features. Burial mounds are common and usually easy to identify, but they are difficult to date (at least without excavation).

Because of their conspicuousness, burial mounds were designated as 'sites' and recorded with a 'site form' immediately, in the field.[4] Raw surface artefact densities, features, and 'special finds' were also recorded in the field – including 'nulls' that affirmed the absence of remains – alongside environmental information.[5] Later, significant 'concentrations' of artefacts and/or features were identified. After further investigation of internal variation ('horizontal stratigraphy') and the relationship between nearby concentrations, 'sites' were defined. Based on this analysis, concentrations were sometimes combined (but rarely divided) to produce 'sites'. Sites differed from concentrations in that the former were assigned a chronological and functional interpretation, while the latter were simply areas where artefacts were denser than, or qualitatively different from, the surrounding background scatter (see section 'Concentrations' below). The project saw no advantage in using one of the neologisms or any other 'neutral' term. Throughout the volume, when a 'site' is coterminous with a 'concentration', the terms are used interchangeably.

TRAP field methods conformed to a 'siteless' survey approach whose product is a continuous map of artefact densities and surface features (including affirmative 'nulls' where nothing was recovered) rather than a list of 'sites'. Chapters 8 and 14 present these densities as heat maps to convey the nuances of the data, and to underscore the subjective judgments made when 'sites' were defined. Sites can be considered an interpretive layer derived from or superimposed over the continuous raw data. This site dataset is still reductive, but it is also more suitable for statistical and spatial analysis, cultural heritage management, and public communication (see Chapters 10 and 16). The advantage of the TRAP approach is that the preservation of the raw survey data facilitates reinterpretation of our 'sites' using different thresholds, allows independent artefact density study (*cf*. Neústupný 1998), and makes it easier to reconcile and combine TRAP data with other datasets. All TRAP datasets and recording forms are published in TRAP Digital Archive (see 'Link to Digital Resources' in front matter).

3.3.4 Concentrations

Although the *post facto* practice of 'site' definition appears straightforward thanks to the broad definition of the term, which includes special finds, earthworks or masonry, and surface artefact concentrations under the same label, in practice it left room for significant interpretive differences. Assessing what comprises a significant variation in surface material distribution was the main challenge. While special finds and standing earthworks or masonry were easy to identify as places of archaeological interest, variations in surface pottery distribution were subject to a series of qualitative and quantitative criteria before they would be nominated as a 'surface concentration', or a 'site'. A 'surface concentration' was defined as:

1. A surface artefact concentration with either a high density of artefacts, or sparser but highly diagnostic artefacts, that were continuous and clearly distinguishable from the background scatter of artefacts. We considered both quality and quantity of material (in contrast to the usually sparse background scatter) when defining a concentration, and no arbitrary density thresholds were employed. The overwhelming majority of surface artefacts consisted of pot sherds.
2. Legacy sites, including all non-mound phenomena that had been described by previous investigations but could no longer be detected when their recorded location was visited.

Most surface concentrations would automatically become 'sites'. Concentrations similar in character and in close proximity (150–200 m) to each other would be aggregated into a 'site'. Further, while the proximity could be assessed quantitatively, the similarity was judged based on material characteristics, and topographic situation, with an eye to possible post-depositional processes involved in the material accumulation and dispersal.

The project did not set arbitrary thresholds to distinguish concentrations against the background scatter (as *e.g.*, Burgers 1998). Each concentration of material was assessed against an intensive survey baseline. If an artefact concentration was located during extensive survey, the team either decreased their walker spacing to intensive mode (15 m intervals) or re-surveyed the area intensively in a second pass (occasionally re-survey was also initiated after the fact based on GIS analysis of unit data). Second pass survey ensured consistency and comparability with other concentrations within the regional dataset.

Following traditional site-based survey methodologies, Bulgarian archaeologists tended to give heavier weight to qualitative criteria. For example, complete or rare single finds, especially prehistoric ones, were submitted as 'sites', even if they were found in relative isolation, whereas moderate increases in the background scatter, if they consisted of poor-quality, nondescript, heavily fragmented pottery, were sometime ignored. Non-Bulgarian researchers, conversely, were more comfortable using quantitative criteria (*e.g.*, artefact density) to define sites according to siteless survey methodology, given their lack of experience with local pottery typologies.

A subjective judgment of boundaries was made using both quantitative (artefact density) and qualitative (artefact fragmentation and wear) criteria in the topographical and geomorphological context in order to finalise concentration boundaries. For most surface concentrations, we defined two density zones. We drew one boundary around the highest concentration(s) of remains, and designated it the 'site nucleus'. We then drew a second boundary around adjacent or nearby areas where artefact densities were lower but still exceeded the background scatter, labelling it the 'site margin'. The aim of designating a

nucleus was to identify the source of the material within the concentration, which could be interpreted as the core activity area or a built space inside a settlement. The definition of a margin was particularly important for the registration of sites in the AKB for their subsequent protection, since erosion and agricultural activity can cause misalignment between the densest surface concentrations and subsurface remains. Where no clear nucleus could be identified (*e.g.*, there was no peak in material density within the entire concentration or, as in case of a quarry, the nucleus was elusive), the entire concentration was labelled 'low-density' and an arbitrary nucleus of 10 sq m was defined for the purpose of GIS visualisation and site size interpretation. In some cases, sites had multiple cores, which were chronologically contemporary or sequential (*e.g.*, sites 2032, 4152, and 6021 in Kazanlak and Yambol site catalogues).[6] Occasionally, a site comprised multiple margins but only one nucleus – this happened when a site was physically divided due to formation processes or human activity, and the observations were combined during the interpretation (*e.g.*, 1006, 2044).

The 'site margin' and 'site nucleus' approach helped us overcome the conceptual homogenisation of sites upon documentation, especially for reassessment of site function over time. Site margins are used as the preferred site size in AKB site cards for regulatory purposes. Site nuclei are used in the analytical and interpretive chapters in this volume, and other research publications (*e.g.,* Sobotkova 2013).

Site catalogues list both nucleus and margin areas. The project became comfortable with, and could easily track, the difference between cores and margins given the separate documentation of raw data from site-interpretive process. The final dataset presented in this volume represents a version acceptable to the entire team, although it is not the only possible one.

3.3.5 Special finds

Typical special finds included grindstones, intact or nearly complete lithics or ceramics, and ancient glass or metal found in isolation. Only a dozen or so artefacts fell into this category. If they were not associated with surface concentrations, burial mounds, or other surface features, then they were recorded separately and immediately in the project GIS (see TRAP shapefiles).[7] If they were associated with another archaeological phenomenon, then they were associated with that entity, collected (if movable), and inventoried. Since the identification of artefact concentrations takes quality into account, there is a continuum between concentrations and special finds: a relatively small, low-density concentration that contained a few largely intact pots would be designated as a concentration with those pots inventoried. Meanwhile isolated, intact pottery would be recorded as a special find. Although the distinction is somewhat subjective, this approach allowed recently exposed materials to receive special consideration for cultural heritage management purposes. It did, however, sometimes complicate research analyses such as site distribution and settlement patterns. Again, presentation of the primary data about both surface artefacts and special finds mitigates these problems, allowing reconsideration of the importance of specific concentrations or isolated finds.

3.3.6 Earthworks and burial mounds

Earthworks such as settlement and burial mounds are the most conspicuous archaeological features in Bulgaria. Due to their relative prominence (compared to surface concentrations), settlement and burial mounds were mostly identified and documented directly in the field (for form see the TRAP Digital Archive).[8] Settlement mounds comprise remains of structural material and artefacts, and were, therefore, documented as a special class of artefact concentrations. Burial mounds were rarely associated with surface artefacts and were identified on basis of their shape and size. The majority were obvious. Three phenomena, however, occasionally complicated identification. First, some burial mounds were 'defunct', largely destroyed by erosion, agricultural activity, looting, or previous excavation. Second, in some areas (particularly those where military exercises were conducted, or in stony agricultural fields), modern earthworks and piles of field stones sometimes resembled damaged mounds. Third, in areas of extensive but abandoned Ottoman settlement, fieldstone and mudbrick buildings sometimes collapsed and were overgrown in a way that resembled a burial mound. Luckily, defunct mounds could often be identified through soil, shadow, or crop marks in satellite imagery (Sobotkova and Ross 2010), while modern earthworks and collapsed Ottoman structures only occurred in certain well-defined areas (such as the military zone in the northwest of the Kazanlak study area). In all three cases, additional scrutiny combined with experience was sufficient to resolve any ambiguities; questionable mounds were often revisited (with local archaeologists when necessary) and their classification as burial mounds was confirmed. Any remaining uncertainty was noted in field forms.

3.3.7 Interpreting site function

Interpreting site function on the basis of unstratified and variably preserved surface concentrations of artefacts is a complex task, outcomes of which have a degree of uncertainty (see Jameson *et al.* 1993, 248–52; *contra* Redman 1978). Prehistoric tells, burial mounds, and walled forts and towers are exceptional, as their function is either manifest, or can be ascertained through existing analogues. For surface artefact concentrations, functional interpretation remains unreliable. This uncertainty is particularly acute in low-density concentrations (*e.g.*, 4125; 3053), or where secondary context is strongly indicated (*e.g.*, 4112). In general, artefact concentrations were assigned functions based on ratios of artefact groups collected during intensive survey and follow-up concentration

Table 3.1 Common functional terms used in the volume and their archaeological basis

Function	*Site interpretation*	*Description*
Residential	Town	Large area (>5 ha), fortification walls, administrative structures, religious sanctuaries, built-up area of habitation within walls, evidence of crafts or industrial activity, historical references, and even a possible identification with a historical or epigraphic references (*e.g.* Seuthopolis, Kabyle)
Residential and Defensive	Fortress or watchtower	Evidence of masonry in elevated positions with a strategic view over the surrounding land. Remains of fortifications, towers, and other structures in agriculturally unsuitable locations. The difference between a fortress and watchtower is mostly in scale; the watchtower usually does not enclose an area with inhabitable dwellings.
Residential	Village or hamlet	Villages, hamlets, and other concentrations that exceed the size of a farmstead but are not more closely identifiable. The cores (areas that can be expected to have contained habitation structures) range in size from 1–5 ha. The scatters contain construction materials – rooftiles, bricks or daub fragments – , and a cross-section of a domestic assemblage: evidence of food storage, processing, cooking and serving activities. The specific types of pottery and lithics vary with chronological period. More than one dwelling is assumed here, with population ranging from 20–150 people (depending on area)
Residential	Farmstead	Concentration containing similar cross-section of domestic assemblage as the village/hamlet above, but with size <1 ha. In Classical period, these may contain imported black-slip pottery, jewellery, beads, lamps, loom weights, glass and coins or other metal objects.
Mortuary	Burial mound	Round earthwork ranging from 0.5–25 m in height, with a round or ellipsoid plan; not of recent origin.
Mortuary	Flat cemetery or single grave	Concentration of artefacts resembling a domestic assemblage (especially with Roman and later periods), with low fragmentation and relatively good preservation, sometimes with fragments of human bones. Graves are usually single hotspots of artefacts, while cemeteries can be extensive. Without human bones these concentrations are easy to conflate with small scale residential scatters
Other	Activity area	Ephemeral, or low density scatters with no or minimum evidence for permanent structures. The location of one-time or seasonal activity, field stations, shelters, etc.
Other	Enclosure or field division	Remains of gracile, low walls on valley floor or mountain slopes with no traces of permanent habitation within.
Other	Quarry	Cuttings in the bedrock faces, for the purpose of removal of blocks of stone, with or without associated cultural material in the vicinity
Other	Ritual area	Concentration of variable size with a narrow range of surface remains. Often only a few categories of finds dominate the assemblage, usually storage vessels (pithoi) or storage pits and serving vessels (high quality pottery). Miniatures, tablets, inscriptions or votives may be present. Construction remains are often missing or in low quantity

sampling (see sections 3.4.4 'Survey unit sampling' and 3.4.5 'Concentration sampling' below). Differences in site size and artefact assemblage may indicate change in a site's function over time. Table 3.1 provides a rough guide to the assumptions that link different surface assemblages to different functional interpretations.

Functional interpretation for earthworks, especially the large (often >100 m diameter) artificial mounds of accumulated prehistoric materials, is largely based on analogues excavated in Bulgaria and elsewhere in south east Europe (Halstead 1987; Milisauskas and Kruk 1989; Halstead and Frederick 2000; Lichardus *et al.* 2000; Nikolov *et al.* 2004). These settlement mounds, or tells, are the remains of ancient villages used on a long-term basis, although not necessarily continually or exclusively (Bailey 2000). Smaller mounds (usually 20–50 m diameter) without dense layers of prehistoric material are mostly interpreted as burial mounds. The majority of them have been shown to contain burials, although some may stand empty as markers of military advance (Jochmus 1854, 49), cenotaphs, or containers of ritual remains (Agre 2016). Since these distinctions can only be made upon excavation, the survey record lists all such smaller earthworks under the label of burial mound. Flat concentrations represent the potential remains of a wide variety of activities from relatively long-term settlements (6018, 8011, 2036) to shorter occupations (2045, 4113, 4117, 1015), to special activity areas (for illustration of functional variety: there is presumably a ritual or elite structure at 4118, isolated stone axe at 2039, a basilica at 4119, and a quarry at 3058).

For all sites, the function may have changed through time, or run against the grain of traditional interpretation. Early Bronze Age (EBA) strata in the Kran tell (4118)

provide an excellent example of such difference. The Kran tell has the form of an artificial mound, which is traditionally interpreted as a long-term settlement, spanning from the Chalcolithic period through the Early Bronze Age. In the case of Kran EBA levels, however, the excavators found a single structure inside the tell, which appears to have served ritual or other ceremonial purposes (Andreeva 2007; Nikolov *et al.* 2010). No traces of the EBA long-term settlement have been found flanking this structure, thus defying the automatic assumption associated with the morphology of a settlement mound and its prehistoric material.

In many surface concentrations, post-depositional displacement complicates functional assessment (Schiffer 1987). A low-density concentration 4117 was found surrounding a pond 1.25 km due east of the Kran tell. This concentration may owe its existence to the pond, as the earth for the construction of the dam was either brought in from elsewhere or dug from lower levels of the site. The possible secondary context of 4117 complicates any attempt at categorising the site's location, nature, or function. Another case is the EBA concentration 3059, which was found on a terrace below 3053, a Neolithic scatter in the Sredna Gora. Positioned only a hundred metres down slope, the Bronze Age component and its Neolithic counterpart may once have formed a single settlement on top of the terraced hill. Down-slope movement is known to transport younger deposits further than the older ones. Given no evidence of Chalcolithic remains, we do not know whether the putative parent site was occupied continuously or whether it was resettled after a hiatus. Such post-depositional displacement is suspected also in 4112 and 4131. The overall impact is an increase in the reported number of sites and artificially created concentrations where none may have existed.

The size and functional definition of artefact concentrations were reviewed after each visit and re-assessed after pottery samples allowed for the identification of available chronological components. Raw reported counts were corrected by unit area in the project GIS to account for variation in unit size. This correction and density visualisation helped refine the spatial mapping of different chronological and functional components. Site interpretation was often finalised only after the season was over, once the entire dataset was streamlined and reviewed by project directors.

3.4 Methods of fieldwalking and documentation

3.4.1 Intensive survey

Intensive survey involved teams of (usually) five walking at a steady rate of approximately 1 m/s using 15–20 m walker spacing (*cf.* Alcock, Cherry and Davis 1994, 137; Kuna 1998, 81; Cavanagh *et al.* 2002; Forsen and Forsen 2003). Walkers were told to assess a 2 m wide swath as they proceeded, meaning that walkers spaced 15 m apart produced a 12.5% visual inspection sample, while walkers who were spaced 20 m apart produced a 10% sample. Each time walkers advanced a distance equal to spacing (*i.e.*, 15 m for 15 m spacing, 20 m for 20 m spacing, *etc*.), artefact counts or densities were recorded, even if zero. The 15×15 to 20×20 m 'cells' produced by this method constituted the smallest scale at which routine record-keeping took place. Ceramic sherd counts or densities, special finds (grindstones, lithics, glass, etc.), and features such as burial mounds or other earthworks were recorded at the level of the cell, along with significant changes in highly variable environmental conditions such as surface visibility, agricultural condition, and stoniness (*cf.* Gallant 1986, 418; Burgers 1998, 261). To better assess the background scatter and seek out patterns that might indicate low-intensity activities, artefact densities were recorded for every cell. Using this approach, background scatter and off-site material were recorded, as well as artefact concentrations.

The team leader chose walker spacing at the beginning of fields or pastures based on the number of walkers, terrain, and the size and shape of the field, and then kept spacing constant unless changes in terrain or vegetation warranted a variation. Walker spacings and interval distance were maintained primarily by counting paces, and checked regularly with a hand-held GPS unit carried by a designated team member. Initially, flags were used to track progress across large fields, but as the project progressed, teams became more comfortable using GPS waypoints to maintain bearings and ensure complete coverage. Artefact counts were called out verbally by walkers and recorded on pre-printed survey forms by a designated team member (see intensive and urban survey forms).[9] At especially dense concentrations, estimated densities in sherds per sq m were used rather than exact counts. Representative diagnostic artefacts were collected by walkers as they advanced (see below). Walkers were encouraged to maintain their pace and spacing even when concentrations were encountered, so as to maintain uniform intensity of survey.

For convenience and speed of recording, cells were grouped into square 'units'. Teams usually consisted of five members, which produced units of 5×5 cells. Units of 75×75 m (five walkers at 15 m spacing) to 100×100 m (five walkers at 20 m spacing) were typical, yielding 0.59–1.0 ha units. Staffing occasionally produced teams of four or six (rarely three or seven), with the size of units scaled proportionately. Square units were preferred, but not mandated; teams were encouraged to terminate units at the edges of fields where environmental conditions changed, sometimes requiring rectangular, triangular, or irregularly shaped units.

Survey units framed progress and record-keeping in the field. At the beginning of the unit, the team leader would

confer with walkers to reach a consensus estimate of surface visibility, agricultural condition, slope, passability, and other environmental variables. This was recorded on the paper survey unit forms. Artefact counts were also recorded on these forms as the unit was walked. At the end of each unit, unit boundaries were drawn digitally using a GPS-equipped PDA running mobile GIS software (ArcPad) by the team leader, who confirmed the unit number with the recording assistant to ensure that paper and digital records could later be joined. Diagnostic artefacts were consolidated, bagged, and tagged with the survey unit number, date, and team identifier (usually a letter, A–D). Team members characterized the type (at least at the level of material using the list above), date (at least ancient vs. modern), and fragmentation of uncollected artefacts they had observed. They confirmed whether the initial environmental conditions held across most of the unit, noting major changes at the level of the cell, and recorded any other information that could facilitate later interpretation of the data collected, especially regarding surface visibility and other environmental conditions, survey coverage, and the nature of artefacts or features.

Unit-level data, including environmental conditions and artefact counts (broken down by type and ancient vs. modern), was fully digitised on daily basis. This information forms the basis of analyses presented in this volume. If environmental conditions or surface visibility varied within a unit's cells, the predominant condition was used. Since walker number and spacing were always recorded, sherd density and other outcomes could be standardised. Cell-level data exist on paper and have been scanned to PDF, but have not been digitised due to labour constraints. Cell-level artefact data have, however, been used during post-processing to draw the boundaries of surface concentrations. See 'Field documentation' below for further information.

3.4.2 Extensive survey

Extensive survey was used when surface visibility dropped below 50% but passability remained 'easy' to 'moderate' (see Extensive survey form).[10] For extensive survey, walker spacing and recording intervals increased to 20–30 m. The larger, 30 m spacing represents the maximum distance allowing easy communication under good conditions; spacing was closer when conditions were less than ideal (*e.g.*, moderate to high winds). As was the case for intensive survey, cells were the finest unit of recording, and they were then grouped into units. During extensive survey, teams of (usually) five walkers produced units measuring from 100×100 to 150×150 m (1.00–2.25 ha). However, we encountered a practical limit of about 125×125 m (1.56 ha units) on all but the calmest days. Again, teams were sometimes larger or smaller, but we found that 150×150 m (2.25 ha units) was the maximum unit size, regardless of team size, that allowed walkers at the end of the line to communicate with the leader in the centre. As with intensive survey, square units were preferred but not required.

Categories for record keeping during extensive survey changed from artefact counts at the cell level to coarser features, such as the presence of sherd concentrations (including an estimate of average and maximum artefact density), grindstones, conspicuous and intact artefacts, and burial mounds or other earthworks. Walkers were encouraged to monitor their entire path for larger features, rather than concentrating on a 2 m swath. In other respects, extensive survey mirrored the intensive mode, including walking and recording practices, and collection of diagnostic artefacts.

3.4.3 Adverse terrain survey (ATS)

In rugged, mountainous terrain, where passability was often difficult and dense vegetation produced variable (but usually low) surface visibility, regular spacing of walkers and synchronised recording of artefacts and features across gridded survey cells and units was abandoned for a more flexible approach compatible with the terrain (compare the adaptive methods discussed by Düring and Glatz 2015, 53–103). Adverse terrain survey (ATS) recognised that topography and vegetation determined the passable routes and degree of dispersal open to walkers. In dense and scrubby forest, or across very rough terrain, survey teams would usually form a tight group and follow any available path, keeping a GPS tracklog and noting how far into the surrounding vegetation they could effectively see to identify large archaeological features like burial mounds. In sparser vegetation and easier terrain, team members would disperse (to a maximum of about 75 m from the central walker), adjusting their spacing to keep one another in sight at all times, and advance in as coordinated a manner as possible. Terrain evaluation was left to the judgment of team leaders, who assessed the difficulty of passage and decided how to proceed. The central walker kept a GPS tracklog and continuously monitored walker intervals and line-of-sight distances, linked to the tracklog by waypoints or by time notations; when conditions changed significantly, a new survey unit was started (again, at the discretion of the team leader). Tracks, dispersal, and line-of-sight distances could then be combined in the project GIS to create a variable buffer representing the ground that had been visually inspected. Walkers recorded environmental conditions such as topography, slope, type and density of vegetation, and surface visibility (see ATS form).[11] Only mounds, earthworks, and other architectural features were routinely recorded under ATS conditions, although road cuts and other patches of exposed earth were carefully examined as they sometimes revealed artefact concentrations (recorded as per extensive survey).

ATS was formalised at the end of the first Kazanlak field season in 2009, based upon the experiences of field walkers during that season. Its purpose was to make the best of poor conditions while accurately describing survey

coverage and intensity. We wanted to tackle difficult areas like the forested slopes of the Sredna Gora, while providing an accurate record that would not imply more coverage than had been achieved. ATS represents our best effort to systematise the documentation of survey in difficult terrain.

3.4.4 Survey unit sampling

This project followed a 'minimal' policy regarding artefact collection during initial surface survey. Only grab samples of clearly diagnostic sherds were routinely collected. This policy can be summarised as: 'I have already collected one such diagnostic artefact in this unit, I don't need another one'. Diagnostic artefacts were bagged at the unit level and labelled with the unit number, and the collection of a sample was also noted on survey forms. The overwhelming majority of artefacts were pot sherds or architectural ceramics. Since shape and decoration have the most developed typologies for Bulgarian pottery, we defined 'diagnostic' sherds as any that preserved recognisable surface decoration or key aspects of the vessel's shape (*e.g.*, distinctive rims) to facilitate chronological attribution. In some cases, fabric could also be diagnostic, but fabric typologies remain underdeveloped in Bulgaria especially for coarse wares. Chronological attribution was principally done by our Bulgarian team members, who in most cases were more familiar with local pottery.

A minimal collection policy was adopted for several reasons: (1) to maintain a uniform rate of progress in the field even when dense concentrations of artefacts were encountered; (2) to keep pottery processing and analysis in pace with survey progress, completed within a week or two at the end of each fieldwork season and mitigating the need for lengthy study seasons; (3) to avoid processing, storing, and responsibly discarding large amounts of non-diagnostic pottery, thus reducing the burden on local museum resources; and (4) to ensure that as much material as possible remained *in situ* for more systematic sampling, such as total pickups (see 'Concentration Sampling' below).

Given the minimal collection policy, the project relied to a large degree on the preliminary characterisation of surface artefacts in the field. Workshops were held early each season to train students and volunteers to distinguish between: (1) ancient and modern material; (2) pottery and architectural ceramics; (3) coarse (likely handmade) wares and fine (often wheel-made) wares. These three characteristics (along with fragmentation) were then recorded at unit level when they were relatively consistent, or for individual cells when variation within units was significant. This additional information produced a better understanding of the surface debris and the nature of the ancient activities it represented. Counting modern sherds, for example, allowed us to monitor the degree to which modern material distracted field walkers or masked ancient material at any given time, while also permitting the reassessment of 'modern' concentrations that, upon further study of diagnostic material, proved to be older (at first glance it is sometimes difficult to tell some Mediaeval or even Roman ceramics from certain types of early modern pottery or tile). The presence of architectural ceramics (including burned daub) provided evidence for structures, rather than simply outdoor activity areas (keeping in mind that some graves were covered or lined with tile or brick). Likewise, the presence of wheel-made fine wares shed some light on chronology and function, generally indicating historic rather than prehistoric origin, and increasing the likelihood that a settlement of some kind had been encountered (again recognising that burials or ritual activities might also produce fine wares). Fragmentation (and to a lesser extent, sherd condition), meanwhile, helped us interpret the importance of raw counts or densities; a high count of extremely fragmented pottery (produced, *e.g.*, by long exposure to ploughing) could represent fewer original vessels than a much lower count of less fragmented and worn sherds. Despite the possible inaccuracies associated with quick visual identification, and the uncertainties inherent in interpretations based on these few characteristics, preliminary characterisation of artefacts helped the project assess daily results and plan follow-up activities such as total-pickup sampling.

Whenever possible, each team also included at least one local specialist who could more accurately identify pottery and other artefacts found in the field. Drawing upon this expertise, uncollected material could be assessed with more confidence. As such, a more thorough evaluation of artefacts was undertaken at the end of any unit containing an artefact concentration. Such an assessment usually entailed returning to the densest area of artefacts with the specialist, who identified diagnostic sherds without removing them, aside from a small, representative sample collected according to the minimal policy described above. As the project progressed and participants gained experience by working with specialists, they contributed further to in-field artefact identification.

This approach combined a minimalist collection policy with in-field assessment of surface material thus reducing the volume of collected artefacts. It also contributed to the speed and efficiency of survey, and left concentrations largely intact for further study.

3.4.5 Concentration sampling

Surface concentrations were routinely revisited for further study, usually by means of total-pickup sampling, in which all artefacts were collected from small sections of surface concentrations to obtain a comprehensive sample of artefacts of every type and date. While the systematic collection of diagnostics during fieldwalking recovered common and highly visible materials, the small, less visible, and less abundant artefacts were more likely to be recovered via total pickup.

Targeting existing concentrations with the help of a density map generated in the project GIS, we placed one or more sample squares within the densest areas (accounting for surface visibility and fragmentation, quality, and condition of artefacts), especially where multiple 'nuclei' could be distinguished in a concentration. Total pickups were conducted by marking 5×5 m or 10×10 m squares (smaller for high artefact densities, larger for low) on the ground and carefully collecting ('vacuuming') every artefact on the surface. The main purpose of total pickups was to obtain a comprehensive and representative sample of artefacts of all kinds and chronological types from a given 'site', and thus refine our understanding of its function and chronology. Multiple total pickups were collected at concentrations of larger size or with greater variability of surface material in order to evaluate changes in horizontal stratigraphy. Given the amount of time and effort required for collecting and processing total pickups, two to four samples per concentration were usually collected, allowing the processing of one or two sites a day.

Preliminary total pickup processing took place in the field. Material was first sorted into types (ceramic, glass, lithic, *etc*.), with ceramics dominating. All artefacts of glass, lithic, metal, or other rare materials were retained for study. Ceramics were then divided between architectural ceramics and pottery. Pottery was further sorted into artefact groups based on technique (hand- or wheel-made), fabric thickness, fabric quality (fine, medium, or coarse, based primarily on inclusion size and sorting), with sub-groups for surface treatments or decoration (*e.g.*, punctation, incision, red-slip, black-slip, glaze, *etc*.). Each artefact group was then counted, weighed, and photographed. Non-diagnostic ceramics were returned to the site, while diagnostic material was retained for further study (so few diagnostic sherds were encountered that all could be retained). Every total pickup produced a significant amount of 'unidentifiable' ceramic (mostly small, poorly preserved, non-diagnostic sherds) which was also counted, weighed, and discarded. Recording was done on paper in the field and digitised at the end of the day (see Total pickup form).[12]

Since artefact groups could often be associated with functional types (architectural ceramics, storage ware, tableware, *etc*.), total pickups quantified ratios of such types. These ratios assisted with the evaluation of site function, especially when the results of total pickups from multiple concentrations were compared.

Total pickups also raised awareness of unobtrusive artefact types that had escaped scrutiny during routine fieldwalking (*e.g.*, ceramics that were highly fragmented or had little colour contrast with the soil). The first total pickups, for example, revealed that initial survey had overlooked handmade pottery, daub, and architectural debris, as well as minute fragments of black slipped fine ware. These findings informed further training for participants and improved the quality of subsequent survey.

Despite the increased recovery of underrepresented artefact types, total pickups rarely improved our understanding of site chronology. Diagnostic sherds were seldom recovered, while non-diagnostic sherds were often highly fragmented and badly worn. The lack of fine chronological control over artefacts prevented functional analysis of samples from multi-period sites. As a result, the utility of total pickups was limited to the functional definition of individual, single-period nuclei or single-component sites (*e.g.*, 2046), or to a broader characterisation of diachronic (or undateable) activity at a multi-period site. Survey unit sampling, with its wider spatial coverage, proved a better vehicle for finding representative diagnostic sherds and thus delineating the overall chronology of a concentration.

3.4.6 Artefact inventory and analysis

Artefacts that were collected during surface survey or total pickups underwent additional processing. All ceramics received a preliminary 'group' analysis by survey unit or total-pickup sample, in which they were divided into similar fabrics and (general) vessel shapes, described, counted, weighed, and photographed (in groups). These sherd groups contributed towards a general functional and chronological framework for artefact concentrations and associated archaeological features like burial mounds. Redundant or insufficiently diagnostic sherds were then discarded, while important diagnostic artefacts (typically stone, metal, glass, and pottery rims and decorated sherds) were fully inventoried. Inventoried artefacts were assigned an inventory number and analysed. In the case of ceramics, the dimensions, fabric, surface treatment, decoration, date, and function were recorded (analogous information was recorded for other types of artefacts). All inventoried pieces were individually photographed, and particularly important sherds were drawn (see digital Artefact catalogue).[13] Vessel type, date, and function were confirmed by local museum personnel. Inventory records were made on paper and digitised on a regular, if not daily, basis.

The inventory process was supervised by Bulgarian colleagues; additional experts in the regional museums or in Sofia were consulted where diagnostics fell outside of the field team's expertise. Drawings of the inventory were digitised in Adobe Illustrator or Corel later in the year. Photographs were immediately labelled by the unit of origin, and provided with a site number and other interpretive keywords.

3.4.7 Follow-up trial excavations

All of the surface concentrations that qualified as 'sites' (see 'TRAP survey interpretation' above) were entered into the Archaeological Map of Bulgaria, the (digital) national cultural heritage register (see Chapter 2). With the permission of landowners and a permit from the Archaeological Institute of Bulgaria some of these surface concentrations (2031, 2032, 3055, 6018) were investigated

through magnetometry and then excavated. Dodoparon (8024), a previously known site relevant to the TRAP research agenda and threatened by looting, was selected for excavation first and then survey conducted around it for context (Chapter 19). Several burial mounds in both study areas were excavated as part of major economic development projects in the region. While the mound excavations were swift and rescue only, they provided important leads on the chronology of these monuments (see Chapter 17; Nekhrizov *et al.* 2013).

Excavations were directed by Bulgarian members of the TRAP team, and are presented elsewhere in this volume or, in the case of Kazanlak campaigns, in the Annual Reports of the Bulgarian Archaeological Institute (Chapters 17, 18 and 19; Nekhrizov and Tzvetkova 2010; Bozhinova 2010). In brief, 'flat sites' were excavated by context where changes were visible, and in shallow spits where they were not. Excavated soil was screened. Artefacts were quantified by group, and diagnostic pieces inventoried. Radiocarbon (C14) samples were taken when charcoal was found (palaeomagnetic samples from hearths were also collected but did not prove suitable for dating). Archaeobotanical samples were collected and floated. These and other samples provided material for paleoenvironmental and paleo-diet studies by international specialists (see Chapter 17 and 19). Results of these excavations not only shed light on individual sites, but also clarified the relationship between surface and subsurface remains and guided functional identification of similar concentrations.

3.4.8 Field documentation

Survey documentation was created digitally in the field to the extent possible using the technology available at the time. Where digital recording slowed survey or total pickup progress, paper was used. The best balance of digital to paper was found relatively quickly: only spatial and essential administrative data (like survey unit numbers) were recorded digitally, while other data were recorded on paper, scanned, and later digitised (at the unit-level for survey). In the field, team leaders operated a GPS-enabled PDA, running mobile GIS software (ESRI ArcPad 7.1) containing high resolution satellite images (IKONOS or QuickBird) and scans of 1:5,000 (where available) and 1:50,000 topographical maps. Using this device, the team leader tracked the location and heading of each team and navigated.

Boundaries of completed intensive or extensive survey units were drawn into the PDA and numbered as they were surveyed, creating a geodatabase record for each survey unit. Points and polygons marking the boundaries of archaeological features were also captured on the PDA. The areas sampled by total pickup were likewise recorded digitally. Artefact, feature, and environmental information were recorded on paper in the field. For ATS, a tracklog was kept using a GPS-enabled PDA or a stand-alone GPS receiver, with other observations recorded on paper. Each team had a GPS unit to track their daily progress and to serve as a backup in case of PDA failure. Tracklogs were downloaded and PDA records were synchronised with the main geodatabase upon return to the base; data recorded on paper were entered into the geodatabase daily, collated by unit number, down to the level of the survey unit for intensive and extensive survey (cell-level data exist as scanned PDFs). This combination maximised the amount of fieldwork that could be completed in each season, while eliminating time-consuming digitisation of geospatial data. All digitised data and scanned paper records are available in the TRAP Digital Archive.[5]

3.4.9 Organisation of fieldwork and post-processing

TRAP teams generally consisted of Bulgarian students of archaeology, international volunteers, and archaeology enthusiasts under the guidance of Bulgarian and international archaeologists (see 'List of participants' in front matter). Most walkers were novices to survey methodology and to Bulgarian cultural material. The first days of each season were always dedicated to the training of new participants. Training included survey methodology, pottery identification, field and base procedures, and paper and digital documentation. For actual field work, each team contained at least one person who was familiar with the survey methodology, and one local specialist, who could identify the surface material found in the field. At least one Bulgarian speaker was on each team to facilitate communication with the field owners and other residents.

Besides field walking and counting sherds, the field walkers fulfilled a range of roles. Each team operated one GPS-enabled PDA to collect core spatial data about survey progress, and filled in paper forms with fine-grained archaeological and environmental information. One field walker carried a handheld GPS to provide a back-up record and assist with navigation, one carried a camera for photographic record, and another had bags and tags for collection of unit samples. All these roles required technical training and were subject to written protocols. The field roles carried over into afternoon post-processing activities.

After each day's fieldwork, teams would return to the base and continue in post-processing activities. Team leaders divided the tasks up among team members, and the team worked for an additional two to four hours in the afternoon, depending on the amount of documentation and pottery washing and processing needed. The GIS specialist would first download each individual team's digital data from the PDA (survey unit shapefiles, and their attributes) and synchronise them with the project geodatabase (using ArcGIS 9.3 and later 10.1). Once the database was up to date, team members would add remaining data (count summaries and environmental variables) from paper to the geodatabase. Most of the fields were set up with coded values (lookup

tables) to prevent typographic errors. In the meantime, other field walkers would download, label, and add keywords to digital photographs in Adobe Bridge or Lightroom. Others would digitise diaries, write up a summary of daily work, describe encountered archaeological phenomena, and cross reference them with pictures and GPS points. All digital documentation took place on personal laptops which were connected to the project server (running MS Server 2008) via a local network. The server held the master copy of the TRAP dataset, which was backed up on daily basis. The server and local network provided a convenient workspace, making it possible for multiple teams to use the same datasets (*e.g.*, GIS rasters and vectors or project photos), while they edited their portion of data. It provided a common workspace, where team members could upload project pictures and files, relieving the drives on their personal computers and eliminating the problem of multiple circulating copies. Team members who followed the backup policy and uploaded data to the server daily were spared the pain of data loss due to personal device failure or theft (see Chapter 19).

While the office work proceeded, other team members washed newly collected pottery and processed dry pottery from the previous day. Pottery processing included the division of material from each unit into 'sherd groups' by fabric and thickness, after which the groups were described, counted, weighed, and photographed. Pottery experts scrutinised the collected batches and selected the best pieces for inventory. These sherds were labelled (by writing the unit of discovery and sequential number with a permanent marker on a strip of nail polish) and placed in an inventory box. For all collected survey pottery, the original survey unit provided the finest point of spatial resolution. Special finds (loom weights, lithics, and grindstones) were the only ones that had defining coordinates. Individual teams undertook pottery processing every couple of days, or whenever pottery accumulated, so as to avoid backlogs. Final inventory, artefact photography, and drawing were conducted under expert supervision during rainy days or toward the end of the season. At the end of each season, all paper forms were scanned into PDF, digitised, and labelled.

Team leaders supervised the post-processing activities, reviewed paper forms and their electronic equivalents, revised concentration descriptions, put all electronic devices on battery charge and ensured the existence of sufficient supplies for the next day. Team leaders were also responsible for weekly data consistency and completeness checks. This review of both paper and electronic information collected by individual teams was scheduled to promote legibility and compatibility of data among the teams, and provided feedback on survey documentation.

3.5 Survey issues and biases

Despite our best efforts to maintain consistency and completeness of data, several issues plagued the project documentation. Hand-written forms suffered from omissions, errors, and illegibility; attributes of the digital data suffered from omissions and errors of entry; pottery bag tags became illegible and had to be painstakingly reconstructed; and photographic documentation was occasionally poor. Most of these problems emerged during the initial season in Kazanlak. They were due to the scale of the project (ca. 25–30 people collecting data every day), the novelty of methodology, which had not been fine-tuned, and a large ratio of novices compared to supervising staff. After the lesson of the first season, stricter controls were put in place and detailed protocols governed every procedure in the project. A few previous participants also helped train new volunteers and systematise the documentation during follow-up seasons.

While the errors owing to procedural inadequacy were discoverable and could be corrected with sufficient investment in training and expert checking, walker effects or biases inherent in field walking (as discussed by Shennan 1985, 40–5) are impossible to correct. Omissions and errors in documentation often emerged during follow-up use, but errors in the counting of sherds or their preliminary generalised identification into modern and ancient pottery and architectural ceramics were not detectable as all this assessment happened only once, in the field.

Studies in southern Italy (Ammerman 1978; Fentress 2000) and East Hampshire (Shennan 1985) show that survey collections are not always replicable, and the data are not entirely reproducible. Artefact misidentification potentially exacerbates the replication problem. While there is large potential for error in the survey unit raw counts, given that majority of field walkers were volunteers who were relatively inexperienced in the identification of Bulgarian cultural material, much of this error is mitigated through the expert analysis of unit grab samples. Furthermore, all interpretations hinge on chronological attributions of inventoried pieces made exclusively by pottery specialists. While there may be misattributions of pottery and architectural ceramics, ancient and modern, it can be easily verified through the tables summarising final pottery analysis results (see Artefact catalogue).[14]

Stephen Shennan wrote extensively about walker effects on survey results in his East Hampshire study (1985). His statistical assessment of inter-walker variation demonstrated that different walkers of the same experience are by no means equal at picking up different materials (1985, 44). Shennan's findings defy the simple assumption that experts are better field walkers than novices and tie much of the variation between walkers to specific categories of artefacts (*e.g.,* some field walkers notice and pick up more lithics, or more recent pottery, than others), rather than a general ability to better see and characterise surface finds. Such tendencies became apparent in operation in Bulgaria. For example, Ilija Iliev or Renee Gardiner, both prehistoric specialists, had a much better eye for lithics than anyone else. Further, Van

Leusen (2002, 4.5–6) summarises the types of conceptual biases that affect field walkers, such as a tendency to sort observations into sets of mutually exclusive categories, or to study only some geographical, typological, and chronological parts of the available archaeological record. These biases play themselves out differently between novices and experts. Novices have less knowledge of material and less awareness of meaningful patterns of information (*e.g.*, topographic setting on a slope or cline, with an erosional surface conducive to the exposure of remains). Consequently, they are unrestrained by existing classifications, categories of knowledge, or heuristic tendencies. Inexperience with cultural material has its shortcomings, such as inaccurate initial classification of material in the field. Our solution to this shortcoming was a simple ancient/modern classification in the field with formal analysis of collected samples by experts, rather than an elaborate in-field classification and no finds collection. We devised the survey from the start with an eye to a large volume of inexperienced volunteers and changing project personnel, and invested effort into training and procedures to mitigate the differences in team member's experience during fieldwork and finds processing.

3.6 Conclusion

This chapter presents a suite of survey methods developed to maximise the archaeological returns from different environments in Bulgaria, while allowing for a continuous and systematic recording of both survey coverage and surface residues in their environmental context. The intensive, extensive, and adverse terrain survey methods differed in the amount of effort dedicated to a given area. Each aimed to retrieve certain kinds of archaeological remains, from artefactual densities to conspicuous features, combining the siteless and site-based approaches adaptively. Their application was determined by surface visibility (vegetation, land use, and other ground characteristics) and passability at the time of survey. Area coverage was monitored, and documentation managed through survey units, whose shape and dimensions varied from square to arbitrary depending on the number of field walkers and field method utilised. Artefactual densities, grab samples, and standing features were documented with reference to these units. The interpretation of surface densities into concentrations and sites happened *post facto* with the help of pottery analysis and GIS-generated density maps. Identified concentrations were subjected to additional resurvey or total-pickup sampling to detect unobtrusive categories of artefacts and the functional or chronological information they provided.

The established methodology differed considerably from site-based survey as traditionally practised in Bulgaria (see Chapter 2). The contiguous coverage and diachronic focus allowed us to monitor change in site distributions, sizes and spacings through time, as well as to assess diachronic variation in settlement and population trends. The digital record of artefact surface density can be subjected to arbitrary filters and interpretive frameworks, thus making the dataset reusable and re-purposable, and expanding its utility beyond the analytical and interpretive pursuits in this volume.

Notes

1 DOI: https://doi.org/10.6078/M76W9855

2 AKB stands for the *Arheologicheska Karta na Balgaria*, the national digital register of archaeological sites in Bulgaria (see Chapter 2 this volume, and Domaradzki 2005). The Bulgarian term for 'site' is *arheologicheski obekt*. The literal translation of 'archaeological object' is quite confusing for English speakers and so we avoid it in this volume. TRAP participants, however, used it interchangeably with 'site' in practice, and so whenever 'archaeological object' appears in TRAP documentation, especially Bulgarian diaries and scanned field forms, it carries the general meaning of 'site' as per AKB usage.

3 Special finds, or *nahodki*, include rare artefacts such as ancient glass or metal, intact or largely complete artefacts (*e.g.*, spindle whorls, lithic tools, ceramic vessels), or large artefacts such as grindstones, especially when such finds are isolated.

4 Site recording form DOI: https://doi.org/10.6078/M7K64G4T

5 Intensive and Extensive survey form DOIs: https://doi.org/10.6078/M73776S5 and https://doi.org/10.6078/M7ZG6QBB

6 Kazanlak site catalogue DOI: https://doi.org/10.6078/M7MW2F76; Yambol site catalogue DOI:https://doi.org/10.6078/M7Z60M4C

7 Kazanlak shapefiles DOI: https://doi.org/10.6078/M7610XD4; Yambol shapefiles DOI: https://doi.org/10.6078/M72805Q7

8 Burial mound recording form DOI: https://doi.org/10.6078/M79S1P33

9 Intensive survey form DOI: https://doi.org/10.6078/M73776S5; Urban survey form DOI: https://doi.org/10.6078/M7PZ56W8

10 Extensive survey form DOI: https://doi.org/10.6078/M7ZG6QBB

11 DOI: https://doi.org/10.6078/M7TQ5ZMM

12 DOI: https://doi.org/10.6078/M7FF3QFJ

13 DOI: https://doi.org/10.6078/M7BP00VK

14 Artefact catalogue DOI: https://doi.org/10.6078/M7BP00VK; other digital resources DOI: https://doi.org/10.6078/M7CC0XRM

4

Archaeological sciences: approaches and methods

Simon Connor and Robbi Bishop-Taylor

Abstract *Integrated environmental research has been a key aspect of the Tundzha Regional Archaeological Project (TRAP) since its inception. To better contextualise settlement patterns within the prehistoric landscape, approaches such as palaeoecology, magnetic mineralogy, sedimentary charcoal analysis, speleothem analysis, radiometric dating, archaeobotany, soil survey, and geochemical analysis have been employed. This chapter describes each of these methods and some considerations of data interpretation. It also briefly describes the main results of those analyses not treated in more detail elsewhere in this volume.*

Keywords *methods; pollen; charcoal; radiocarbon dating; magnetic susceptibility, archaeobotany; soil science; erosion modelling*

4.1 Introduction

The natural environment provides the context for cultural change. Changing temperature, rainfall, soil composition, vegetation, erosion, and other environmental factors constrain subsistence strategies. Beginning in the second millennium BC, humans instigated major changes to the vegetation of the northern Thracian Plain, creating new landscapes and forging new relationships between humans and the environment.

Understanding long-term environmental change has been a primary goal of the Tundzha Regional Archaeology Project (TRAP, see Chapter 1). The project has deployed a range of archaeological sciences to explore the natural environment, and human interaction with it, from the Late Pleistocene to the present. Palaeoecological studies, including palynology, microscopic and macroscopic sedimentary charcoal, mineral magnetism, archaeobotany, and speleothem analysis were undertaken in the Kazanlak and Yambol study areas as circumstances allowed, and formed the bases of palaeoenvironmental reconstructions. In the Kazanlak region, a soil survey added to this picture (see Chapter 7), providing information about erosion, soil productivity, and agricultural potential. An ambitious program of environmental sampling supplied the materials for these analyses.

TRAP used proven, well established approaches, but their application – the combination of approaches and the areas studied – represents a first for Bulgaria. The individual methods used by TRAP, such as palynology, speleothem analysis, archaeobotany, and soil survey have been used previously in Bulgaria (*e.g.*, Boyadzhiev 1994; Bozilova and Tonkov 2000; Marinova 2007; Stoykova *et al.* 2008), yet no other project has integrated them with one another and with archaeological survey on a regional scale. The principal environmental sampling site for palaeoecology, Straldzha Mire, also represents one of the few lowland applications of this approach in the Balkans, one that sits within the Thracian Plain, a major agricultural area since the Neolithic. This research program has produced a narrative of long-term environmental change and human habitation in the Thracian Plain and Kazanlak Valley.

4.1.1 Research aims

By incorporating extensive environmental sampling and diverse analytical approaches, TRAP sought to:

- reconstruct Holocene environmental change (climate, soils, vegetation, and fire occurrence) using multi-proxy, quantitative approaches;
- elucidate the natural processes that have affected the differential preservation and distribution of archaeological record through the Kazanlak and Yambol landscapes;

- evaluate human impact on the natural environment;
- place settlement patterns and subsistence strategies in the context of a changing environment;
- understand plant use and subsistence strategies in major archaeological sites; and
- accurately date the timing and duration of key palaeoenvironmental changes.

4.2 Approaches

TRAP's focus on flat-to-rolling lowlands of the Kazanlak Valley and Thracian Plain meant that palaeoenvironmental research concentrated on these areas as well as the surrounding foothills and mountains. A range of palaeoecological approaches were combined with speleothem, soil, and archaeobotanical analyses.

For palaeoecological research, environmental sampling sites (lakes and mires) with long sedimentary sequences were selected, potentially covering the entire Holocene (*i.e.*, the last 11,700 years), that were amenable to multi-proxy investigations. This often meant selecting sites that had been overlooked or rejected by previous investigators because they were considered to have been compromised by twentieth century reclamation works, including the drainage of wetlands and construction of reservoirs (Stoyneva and Michev 2007). In many cases these activities had indeed destroyed the uppermost layers of the sediments, removing or disturbing any information on recent environmental change. The deeper, older sediments, however, seemed less affected and showed considerable promise for reconstructing Holocene environmental conditions. Despite the challenges of working with partially compromised sampling sites, the potential benefits in areas or time periods lacking palaeoenvironmental information outweighed the difficulties. The Straldzha Mire in the northern Thracian Plain proved a particularly fruitful sampling site (see Chapter 13 and Connor *et al.* 2013).

Interpretation of past environments based on sediment sequences relies on knowledge of how sediments reflect present-day environments. For example, an oak forest might be recorded by high levels of oak pollen in the sediments of a neighbouring wetland, or a recent fire might be reflected by large numbers of charcoal particles entering a nearby lake (Birks and Birks 1980). In order to understand the incorporation of environmental proxies into sediments, we undertook a large-scale calibration study. Using the *Inventory of Bulgarian Wetlands and their Biodiversity* (Stoyneva and Michev 2007), sampling sites were selected across the whole of Bulgaria. To achieve a representative coverage and avoid issues of spatial autocorrelation, a single site was selected to represent each UTM grid square, thus reducing the bias toward areas with numerous wetlands, such as the glacial lakes of the Pirin and Rila Mountains and the coastal lagoons along the Black Sea coast (many of which have been previously subjected to palaeoecological analyses, *cf.* Bozilova and Smith 1979; Filipova 1985; Bozilova and Beug 1992; Bozilova and Tonkov 2000; Stefanova and Ammann 2003; Filipova-Marinova *et al.* 2011; 2013; Tonkov *et al.* 2011; 2014). Samples from the selected sites not only helped interpret palaeoenvironmental proxies from the study areas, but also formed part of a continental-scale calibration data set for quantitative palaeoenvironmental reconstruction (Davis *et al.* 2013).

Bulgaria is rich in caves which provide excellent repositories for past environmental information. Stalactites and stalagmites (speleothems) form in karst areas, and as speleothems accumulate over time they incorporate and preserve isotopic signatures and trace elements that reflect temperature, rainfall, vegetation cover, and other aspects of their environment (Schwarcz 2007). Such records can be dated using radiometric methods, or distinct annual bands in the speleothem can be counted to provide a chronology. Previous research on Bulgaria's speleothems has focused on their ability to record changes in solar activity and cosmic ray flux (Shopov *et al.* 1996; Stoykova *et al.* 2008), rather than Holocene palaeoclimate. After extensive reconnaissance in Bulgarian karst areas, the TRAP team succeeded in obtaining a promising stalagmite from a cave in the Stara Planina above the Kazanlak Valley for detailed palaeoenvironmental analysis (see Umbo 2013).

Soils are created through the complex interaction of parent materials (bedrock), climate, biological activity (such as vegetation and soil biota), topography, and drainage over time. Because the processes that lead to soil formation occur over long timescales, soil properties may be used to infer environmental conditions in the past, as well as provide information relevant to understanding the distribution and preservation of archaeological materials (Zangger *et al.* 1997; Wilkinson 2005). The marriage of soil sciences and archaeological survey has the potential to yield information about prehistoric settlement distribution and soil resources on a comparable spatial scale. Extensive soil surveys have been undertaken throughout Bulgaria at various spatial scales (Koynov *et al.* 1968; Boyadzhiev 1994), but all were too coarse for comparison with the results of archaeological surface survey. Geoscience students from UNSW Australia affiliated with TRAP therefore undertook a targeted, fine-scale soil survey of the Kazanlak study area in order to map soil properties and erosion potential in an archaeologically rich landscape (see Chapter 7).

Plant remains found during archaeological excavation are valuable archives of information on past plant use, resource availability, agricultural practices, trade networks, and diet. Such remains may also help to determine the function of archaeological activity areas by identifying grain processing, food storage, and other activities that may not be discernible except through archaeobotany. Archaeological projects in Bulgaria often include archaeobotanical investigations (*e.g.*, Marinova 2007).

As part of the excavations at Dodoparon, TRAP team members recovered and analysed charred seed remains from several archaeological contexts, aiming to shed light on plant use and food production in this important regional centre (see Chapter 19 and Connor *et al.* 2013).

4.3 Research methods

4.3.1 Sediment sampling

Sediments were collected from each of the study sites with appropriate sampling equipment. A trench was dug into the side of the Straldzha Mire clay quarry to expose the sediment stratigraphy. Samples were removed with a trowel; a clay auger was used for the Straldzha Mire canal record; shallow sediment samples were collected from various lakes from an inflatable boat, from all over Bulgaria, using a Kajak corer. Samples were sealed in labelled, airtight plastic bags and stored in a refrigerator for later analysis. Study sites are shown in Figure 4.1. To date, the analyses described below have been performed on the Straldzha Mire quarry and core samples, numerous surface samples from lakes across Bulgaria, the Kazanlak Valley soil samples, the Stara Planina speleothem, and the Dodoparon archaeobotanical samples.

4.3.2 Radiocarbon dating

Accelerator mass spectrometer (AMS) radiocarbon dates were obtained on 13 samples from the Straldzha Mire sediments. While ideally these dates should be performed on short-lived terrestrial organic material (*e.g.*, seeds or leaves of non-wetland plants), no suitable macroscopic material of this kind was found in the samples. Dating of the pollen fraction or bulk organic content was used instead. Pre-treatment of samples followed two different procedures. Dating of the pollen fraction was performed using the procedure of the Australian Nuclear Science and Technology Organisation (ANSTO), based on Brown *et al.* (1989). Bulk organic content in other samples was dated after hand picking to remove younger rootlets and treatment with dilute hydrochloric acid (HCl) to remove contaminating carbonates. The marl-rich sediments of the Straldzha Mire are likely to contain significant amounts of dead carbon with a potentially infinite radiocarbon age. Real ages may therefore be younger than reported ages where carbonate contamination was incompletely removed by the acid pre-treatment.

An age-depth model of the Straldzha Mire quarry section samples was constructed using the Bayesian approach implemented in OxCal 4.1.7 (Bronk Ramsey 2009). This approach, Markov chain Monte Carlo analysis (MCMC), considers prior information about sediment stratigraphy (*i.e.,* that older samples are found deeper in the sediment). MCMC calibrated the ages using the IntCal09 curve, converting radiometric dates into calendar ages and providing, at the same time, error estimates for each sampling depth. The resulting age-depth model was extended to cover the entire quarry section using linear extrapolation. An age-depth model for the canal core was

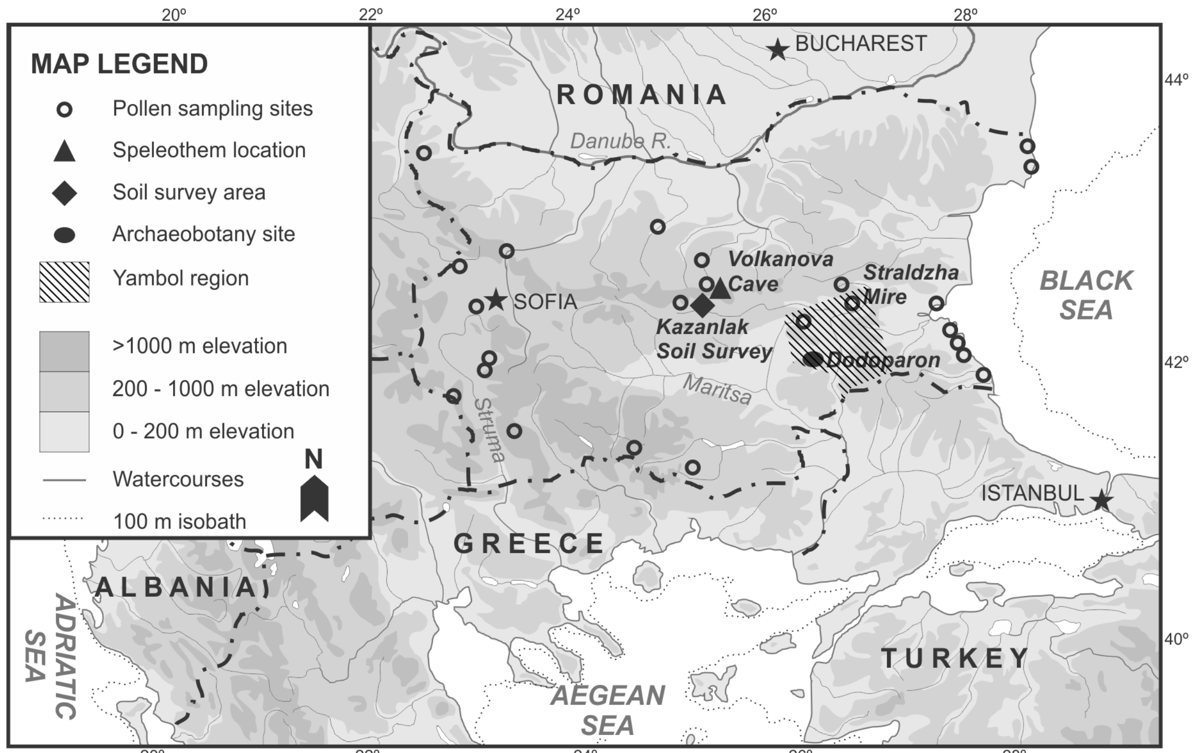

Figure 4.1 Map of Bulgaria showing sampling locations for palaeoecological analyses, soil survey, archaeobotanical and speleothem analyses conducted as part of TRAP.

produced through biostratigraphic correlation using the same sedimentation rate as the quarry section. Overall, the dates of the Straldzha Mire quarry section ranged from approximately 38,000 to 4,000 calibrated years BP, while those of the canal core were about 8,000 years BP to the recent past (see Connor *et al.* 2013).

4.3.3 Pollen analysis

Pollen analysis was performed to reconstruct the past regional-scale vegetation. Subsamples 1 cm^3 in size were extracted from the sediment samples for pollen analysis ('pollen' is used here as a generic term encompassing pollen, spores, and non-pollen palynomorphs, such as fungal and algal remains). Pollen is made of an exceptionally acid resistant compound called sporopollenin. Its acid resistance means that pollen can be successfully isolated from sediments using a variety of acids, which remove unwanted components of the sediment. An alkaline solution of 10% KOH (potassium hydroxide) is often used to remove humic acids from organic rich sediments. In the case of the Straldzha Mire, this step was omitted to avoid damage to the pollen, which was already partly affected by oxidation caused by the artificial drainage of the Mire in the 1930s. A solution of 10% hydrochloric acid (HCl) was used to liberate carbonates from the sediment samples. Pollen and charcoal were separated from the denser mineral particles using density separation in 'heavy liquid' (sodium polytungstate solution with a specific gravity of 2.0). A few drops of hydrofluoric acid (48% HF) were added at the end of this process to remove any remaining silica. Acetolysis, a 9:1 mixture of acetic anhydride and concentrated sulphuric acid, was used for one minute to remove extraneous organic material and to clean the pollen grain surfaces for microscopic identification (Moore *et al.* 1991).

Pollen residues were mounted in glycerol for identification at 400× magnification. Identifications were based on published atlases and keys, such as Moore *et al.* (1991), Chester and Raine (2001), and Reille (1999). Non-pollen palynomorphs, which include ecologically important algae, fungi, and other microscopic remains, were identified as well, based on Jankovská and Komárek (2000), van Geel (2001), and van Geel and Aptroot (2006). Efforts were made to achieve the greatest possible taxonomic precision (*e.g.*, species level) and at least 200 pollen grains from terrestrial (non-wetland) plants were identified in each sample, with an average of 600. Once all pollen had been identified, stratigraphic diagrams depicting pollen percentages by sediment depth were produced using Psimpoll and Tilia software (Grimm 1992; Bennett 2002). Ward's Minimum Variance Cluster Analysis, Detrended Correspondence Analysis, and Indicator Species Analysis were performed in PC-Ord (McCune and Mefford 1999), while pollen rarefaction was performed using the 'vegan' R package (R Core Team 2015; Oksanen *et al.* 2015).

Results from the Straldzha Mire were published in Connor *et al.* (2013). The pollen record demonstrates persistent aridity until at least ca. 6,900 BC, anthropogenic deforestation during the second millennium BC, and relatively stable, open vegetation thereafter. Chapter 13 describes the implications of those results for understanding the vegetation that surrounded prehistoric settlements in the Yambol district and tracks the changes in the wild plant resources available to humans through different archaeological periods.

4.3.4 Sedimentary charcoal analysis

Macroscopic charcoal is analysed separately from microscopic charcoal to differentiate between local fire history (macroscopic charcoal) and regional fire history (microscopic charcoal). Macroscopic charcoal generally describes particles greater than 125 or 250 µm, which are sieved from the sediment after bleaching away other organic material (Whitlock and Larsen 2001). For this study, sediment subsamples of approximately 2 cm^3 were placed into dilute bleach (sodium hypochlorite 4.2%) for 24 hours (Rhodes 1998; Mooney and Tinner 2011). This mixture, washed over a 250 µm sieve, retained particles greater than this size for analysis of local fire history. Particles were hand sorted to remove any excess organic or mineral matter and the remaining charcoal particles were photographed using a high resolution digital camera. Image analysis software (Scion Image 4.0.3.2) was then used to convert these photographs, after appropriate calibration, into charcoal concentrations (charcoal area per cubic centimetre of sediment: $cm^2\ cm^{-3}$). Charcoal concentrations were converted to accumulation rates based on the deposition time of each sample, determined by the age-depth model for the sediment sequence.

Microscopic charcoal, because of its small size, can be carried by winds more readily than macroscopic charcoal. This means that it can be produced by fires a long distance from the lake or wetland where the particles are eventually deposited, recording a regional fire signal. Microscopic charcoal particles were identified on pollen slides and quantified using the point-count method developed by Clark (1982). This technique uses the eyepiece micrometre of the microscope as a sampling frame and provides an estimate of the charcoal area per unit volume of sediment ($cm^2\ cm^{-3}$). Observations of microscopic charcoal were spaced regularly across the microscope slide at 400× magnification and continued until at least 800 individual points on each slide were assessed. More points were counted if the charcoal concentration was low.

Using both these methods, two major periods of increased fire occurrence were identified at Straldzha Mire – one corresponding to the Early Holocene transition from semidesert to forest-steppe vegetation, and the other corresponding to the decline of lowland forest vegetation during the second millennium BC (*cf.* Chapter 13; Connor *et al.* 2013).

4.3.5 Mineral magnetism

Magnetic susceptibility is a useful non-destructive analysis that can be applied to sediment records to detect, amongst others, catchment erosion and fire events, as well as changes in lake productivity and sedimentation (Sandgren and Snowball 2001). Magnetic susceptibility measurements were taken from the Straldzha Mire samples at regular intervals using a Bartington MS2 magnetic susceptibility meter (Dearing 1999). Additional magnetic measurements were taken using a Variable Field Translation Balance to better understand the relative contributions of different magnetic minerals to the susceptibility profile (*e.g.*, haematite, magnetite, goethite, and maghaemite) and to infer the relative contributions of paramagnetic and ferrimagnetic materials.

Variations in the magnetic mineralogy in the Straldzha Mire record correspond to changes in sediment characteristics, with more enhanced magnetic susceptibility in the Pleistocene-aged minerogenic sediments compared to the carbonate rich lake sediments of Early to Mid-Holocene date (Connor *et al.* 2013). Detrital inputs from catchment erosion (especially magnetite) appear to have declined from the Late Glacial to the Early Holocene, probably as landscape stability increased, precipitation and vegetation cover increased, and sedimentation processes within the lake changed from allochthonous to autochthonous deposition. The highest values of magnetic susceptibility are found at the sediment surface and are associated with recent soil formation – a consequence of twentieth century drainage works at Straldzha Mire (*cf.* Connor *et al.* 2013).

4.3.6 Speleothem analysis

To better understand environmental changes in the Kazanlak region, a 235 mm stalagmite from Volkanova Cave in the Stara Planina was analysed at the University College London (Umbo 2013). The top and bottom of the stalagmite were dated with the Uranium:Thorium (U:Th) decay series using a multicollector inductively-coupled plasma mass spectrometer (ICP-MS). This provided an age of 125,000±4,500 years before present for the bottom of the stalagmite and 4,500±4,500 for the upper, most recent layers (Umbo 2013). Between these dates, annual bands were photographed and used to create an age model for the intervening sections of the speleothem. Nine sections with obvious banding were chosen to develop the model. Distances between annual bands were converted to growth rates using a MATLAB script (Smith *et al.* 2009) and the resulting model extrapolated to the entire speleothem.

Ninety samples were removed at regular intervals along the growth axis of the stalagmite using a diamond-tipped drill. Samples of 100 µg were placed in decontaminated glass vials, to which 0.1 ml of 100% phosphoric acid was added by injection prior to determination of isotopic ratios by mass spectrometry (Umbo 2013). In addition, trace element concentrations of environmentally indicative elements – Al, Ba, Fe, Mg, Mn, Sr, and U – were determined by ICP-MS, following the protocol of Yu *et al.* (2005). Noble gas analysis was performed by laser ablation (Umbo 2013).

The data revealed a major shift in isotopic composition during the Early Holocene (Umbo 2013), suggesting a change in aridity consistent with previous palaeoecological interpretations (Wright *et al.* 2003; Connor *et al.* 2013). These interpretations, however, remain tentative until further dates are acquired.

4.3.7 Soil survey and erosion modelling

To complement archaeological pedestrian survey in the Kazanlak Valley, TRAP team members collected surface soil samples across a 215 sq km study area encompassing all significant land-use units in the valley. To eliminate selection bias while ensuring that all regions of the study area were adequately sampled, a stratified random sampling approach was employed. The study area was gridded into 1 sq km squares and a sampling site randomly selected within each square (avoiding urban areas, reservoirs, and military bases).

Over the course of nine field days (between 4 and 16 November 2011), 155 soil samples were collected from accessible areas at an average rate of 17 samples per day. Sampling required minimal equipment (a GPS-enabled PDA, shovel, plastic collection bags, and a vehicle for transport between sites) and was, by design, sufficiently straightforward to allow team members to be rapidly trained in the field. Sampling efficiency was higher in open fields and plantations (127 sites at 23 per day) with a high density of tracks and roads, and lower in the dense forest south of Koprinka Reservoir (28 sites at eight per day), where accessibility was poor. Sampling rates increased as the project progressed, as we began operating two teams simultaneously in different regions of the valley and improved transportation arrangements to minimise travel time on foot between sites.

Soil texture, colour, and carbonate content were assessed using standard US Department of Agriculture field methods, Munsell colour charts, and soil reaction to dilute HCl (*cf.* Chapter 7). These laboratory techniques provided rapid results, and could be conducted at the project base after each field sampling day without requiring sophisticated equipment. Soil geochemistry was subsequently analysed using a portable X-ray fluorescence spectrometer (Olympus Delta 4000), measuring elements such as silicon, iron, potassium, calcium, aluminium, and trace metals. The spatial distribution of these soil properties and elements were interpolated across the Kazanlak Valley using kriging and the results mapped in a geographic information system (GIS).

Two widely used models were combined to generate maps of erosion potential across the Kazanlak Valley – the Revised Universal Soil Loss Equation (RUSLE) model (Renard *et al.* 1997) and the Unit Stream Power-based Erosion-Deposition (USPED) model (Mitasova *et al.*

1996). These models take into account factors such as soil erodibility (based on sample data collected above), rainfall erosivity, topographic relief, vegetation cover, and soil conservation measures. To ensure reproducibility, erosion modelling was conducted using R scripts (R Core Team 2015) and freely available open-source software including GRASS GIS (GRASS Development Team 2012). The resulting modelled estimates of erosion and deposition potential were mapped for the entire valley at high spatial resolution (30 m raster cells) to facilitate comparison with archaeological survey data, revealing areas where surface remains were likely affected by erosion. Results of the soil surveys and modelling, along with details of the analysis, are presented in Chapter 7.

4.3.8 Archaeobotany

Charred plant remains were extracted from material excavated from the Dodoparon hilltop settlement (*cf.* Chapter 19) to understand this site's uses and its links with the surrounding agricultural landscape. A Siraf-type flotation machine (French 1971) was used to liberate charred plant material from soil samples representing three archaeological contexts at Dodoparon. Around 128 litres of excavated material were floated and the charred remains air-dried for transport and further analysis. Remains were sorted into several size classes to aid identification and counting. Charred seeds were identified to species level (crop plants) or genus/family level (wild plants) under a dissecting microscope with the aid of the University of Sheffield's seed collection and published seed atlases (Musil 1963; Cappers *et al.* 2006). The full range of the European crop assemblage was identified; of particular interest was the recovery of significant amounts of millet, echoing some historical sources (*e.g.*, Demosthenes 8.45), as well as the results of skeletal stable isotope analysis at Boyanovo (Chapter 17, although note that these remains are much older than the analysed plant remains). Archaeobotanical results are presented in detail alongside archaeological data from Dodoparon in Chapter 19.

4.4 Conclusion

Environmental research conducted in tandem with archaeological survey and excavation has produced a rich palaeoenvironmental dataset with an unusually broad geographic and temporal scope. The combination of techniques adopted by TRAP allows inferences to be drawn on the history of climate, vegetation, fire, catchment stability, soil formation, and plant exploitation, illuminating how these environmental factors interacted with human habitation and subsistence practices in the Thracian Plain and Kazanlak Valley over time. Some of these inferences are dealt with in greater detail in Chapters 7, 13, and 19. Other ongoing analyses promise to reveal still more about the evolving historic environments of Thrace.

PART II
Kazanlak Valley

5

Kazanlak Valley: topography and environment

Adela Sobotkova and Shawn Ross

Abstract *This chapter introduces the topography, climate, environment, and demography of the Kazanlak Valley and the surrounding Balkan Mountains in central Bulgaria, one of the Tundzha Regional Archaeology Project (TRAP) study areas. The Kazanlak Valley is an intermontane valley, lying between the Sredna Gora to the south and the Stara Planina to the north. The dominant feature of the valley is the Tundzha River, which has been dammed near Kazanlak to produce the Koprinka Reservoir. The valley has a warm, humid, continental climate, with adequate water. The fertility of soils varies, supporting perennial and annual agriculture in some areas, forest and pastureland in others.*

Keywords *Kazanlak; the Valley of the Roses; the Valley of the Thracian Kings; climate; environment; demography*

5.1 Introduction

The Kazanlak Valley is perhaps the most beautiful region in Bulgaria. The landscape captivates the visitor. Picturesque villages are surrounded by fields of roses and lavender or oak and walnut groves. Snow-capped mountains enclose the valley, creating a natural amphitheatre. This charm, together with pleasant climate, wealth of resources, and protected position has attracted people to settle in the valley since earliest times. The Kazanlak Valley contains hundreds of archaeological sites spanning from prehistory through the Ottoman period. In the middle of the valley, the Koprinka Reservoir now conceals the place where Seuthopolis, the Early Hellenistic Thracian royal metropolis, once stood. Prehistoric tells sit quietly while cars and horse carts pass from village to village on narrow, paved or dirt roads. Herds of cattle and sheep driven from the villages each morning graze fallow land or fields of sprouting grain. They appear wherever a patch of grass can be found: road margins, field divisions, and around the tells and burial mounds, leaving the landscape neatly trimmed. Similar flocks maintain the deforested spurs of the Stara Planina, exposing Mediaeval ruins along the mountain passes and enclosures that extend up the slopes. Still higher, they graze alpine meadows.

The topography, climate, vegetation, and history of habitation in Kazanlak are quite different from Yambol even though only about 100 km separate the two. The intermontane valley of the former provides environments and archaeological landscapes that differ dramatically from the latter's rolling lowlands. The climate is more continental and landscape more populous than in Yambol.

5.2 Topography

The Kazanlak Valley (Fig. 5.1) lies near the geographic centre of Bulgaria in the Stara Zagora province. It is the largest intermontane valley in central Bulgaria, some 50 km long and 10 km wide, oriented east to west. The valley floor lies between 350 and 540 masl. The valley is bounded in the south by the forested Sredna Gora ('Middle Hills') and in the north by the higher, more rugged Stara Planina ('Old Mountains'; see Fig. 5.2). The transition between the valley floor and Stara Planina is abrupt and defined by a tectonic fault.

The relatively young peaks of the Stara Planina rise 2,000–2,300 m above the valley; they consist of a mixture of Triassic limestone (200–250 million years old) with volcanic-sedimentary rocks from the Cretaceous (80–90 million years old; see colour figure 1; *cf.* Archibald 1998, 11–12). The Sredna Gora are composed of older plutonic rocks from the Permian and earlier, are more weathered, and are lower (from 350 up to 1,600 m). Only the northern slopes of the Sredna Gora fall into the Tundzha Regional Archaeology Project (TRAP) study area. While the elevation range (350–600 masl) of the northern slopes

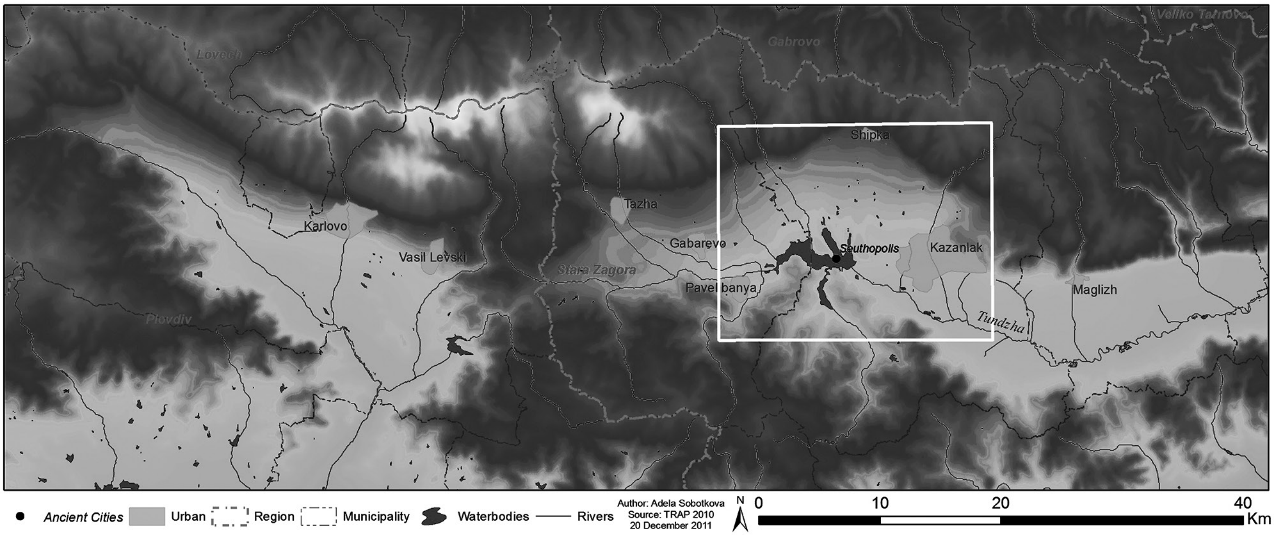

Figure 5.1 Map of the Kazanlak Valley, also called the Valley of the Roses or the Valley of the Thracian Kings. Study area indicated.

Figure 5.2 A view of the Kazanlak Valley looking from the centre of the valley north to Mt Botev (2,376 masl).

overlaps that of the valley, the hilly forested terrain contrasts with the sloping valley floor.

The valley is shaped like a narrow lozenge, with the Tundzha River following its southern edge at the foot of the Sredna Gora. The river has been dammed southwest of Kazanlak, creating the Koprinka Reservoir. The Reservoir is situated at a natural gorge at the contact zone between carboniferous granites of the Sredna Gora and an isolated outcrop of Eocene conglomerates that rises from the valley floor (Tsankov, Filipov and Katskov 1995). Many tributary streams have been channelised. The southern part of the valley is ca. 150–200 m lower than the northern edge, giving the valley floor a southern aspect with abundant sun exposure. The landscape of the valley consists of flat to gently rolling alluvial terraces near the river and colluvial fans and fields at the foot of the Stara Planina. Soils on the valley floor are thin and stony near the mountains, as they rest on the substrate of Quaternary sands and clays. The most fertile alluvial soils can be found on river terraces near the Tundzha River (Dennel and Webley 1975, 98–100; Archibald 1998, 16–18).

In its larger context, the Kazanlak Valley is enclosed and somewhat isolated. The gap between the Sredna Gora and the Stara Planina closes to the west at the head of the valley. Hills or mountains thus guard access from the north, west, and south. Passage is easier to the east through a rolling, narrow corridor following the Tundzha River between the Stara Planina and the diminishing Sredna Gora, and eventually the valley opens out onto the Thracian Plain southeast of Sliven. The Black Sea lies about 200 km further to the east through relatively easy, rolling terrain, while the Aegean Sea lies about 300 km south, and can

be reached most easily by travelling east and then south following the Tundzha and Maritsa Rivers (see Fig. 1.1).

5.3 Administrative organisation and demography

Administratively, the Kazanlak Valley is divided between the Kazanlak municipality and small parts of Pavel Banya and Maglizh municipalities – three of the 11 municipalities within the Stara Zagora province. Kazanlak is the major urban centre in the valley, the population being approximately 50,891 in 2013. The town of Pavel Banya (population ca. 2,600 in 2013) in the Pavel Banya municipality, lying about 15 km to the west of Kazanlak and renowned for its mineral baths, is the second largest town in the valley. The next ranking towns are Shipka (population ca. 1,500) and Kran (population ca. 1,000), in the Kazanlak municipality. About 16–18 villages (depending on how the valley limits are defined) complete the 'urban' landscape in the valley.

While a small part of our research area extended into the Pavel Banya municipality, the majority was located within the Kazanlak municipality, which stretches from the Sredna Gora in the south, across the valley, and northward into the Stara Planina. This municipality includes 632 sq km (about 12% of the 5,151 sq km in the Stara Zagora province) and had 71,043 inhabitants as of 2013 (some 21% of the 328,104 living in the province). The average density of habitation in the Kazanlak municipality was 112 people per sq km in 2012 (in the Stara Zagora province it is 64 per sq km, because of sparse population in the mountains). The average population density in Bulgaria in 2012 was 67.3 people per sq km. Kazanlak municipality ranks among more densely inhabited regions within Bulgaria. As in other parts of Bulgaria, the Kazanlak municipality is relatively urbanised. Over 65% of residents live in the city of Kazanlak itself, another 5% live in the next two largest towns (Shipka and Kran), and the remaining 30% are divided between 21 smaller villages (NSI 2015 'Population', table 6.1.1).

5.4 Environmental setting

5.4.1 Climate

Bulgaria's weather and climate are dominated by latitude, topography, and elevation (Velev 2002). Cradled between parallel mountain ranges and hence protected from the fierce north winds of winter, the Kazanlak Valley has a temperate climate, classified as Dfb 'humid continental' in Köppen-Geiger system (Climate-Data.org, Climate: Kazanlak). The winters are generally cold and wet, and the summers cooler than in much of Bulgaria. January is the coldest month of the year with a –1.1°C average temperature (see Fig. 5.3). July is the warmest month in Kazanlak with an average temperature of 21.2°C (a

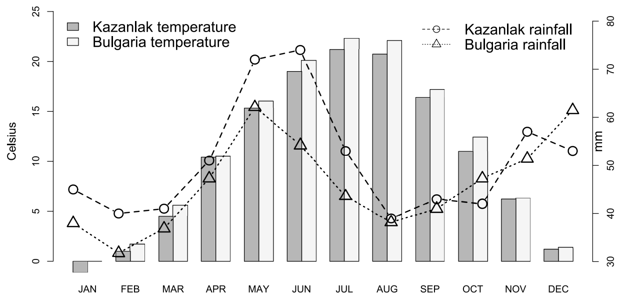

Figure 5.3 A comparison of average temperature (°C) and rainfall (mm) between Kazanlak and Bulgaria. Based on data from 1982–2012, http://en.climate-data.org/location/28264/.

full degree below the Bulgarian average), with summer maximums reaching 27°C.

Annual precipitation rates range from 500 mm to 650 mm in the Kazanlak Valley. The heaviest precipitation falls between April and June (June is the wettest month with 74 mm), while August is the driest month at 39 mm. The Stara Planina intercept most of the precipitation coming from the west and north; at higher elevations, precipitation is orographically enhanced (>1000 mm above 1250 masl), resulting in a reliable year-round water supply for the valley (the Stara Planina often have snow-covered summits late into the year). The rate of potential evaporation also decreases with elevation. In the Bulgarian highlands potential evaporation is strongly correlated with altitude and aspect. On the northern slopes of Stara Planina and other areas above 500 masl elevation, potential evaporation is below 700 mm per year (*cf.* the Thracian Plain values near 1000 mm per annum in Knight and Staneva 1996, 349). According to hydrologists, much of Bulgaria suffers from a potential moisture deficit, as 70% of precipitation is lost through evaporation annually. Highland areas with positive water balance are critical for Bulgarian water resources; on the south facing slopes of the Stara Planina positive balance occurs at 600 m, while on north facing slopes it can occur as low as 300 masl (Knight and Staneva 1996, 349, fig. 2).

Monthly averages assembled over decades, however, can obscure a lot of variability. There is only 0.5–1°C difference in temperature averages between the Kazanlak and Yambol study areas, and nearly equal amounts of precipitation (if we follow the European Union climate-data.org site), but the weather patterns are strikingly different. Spring in Kazanlak had the feel of winter, with late snowfalls and many more cold and rainy days than the average rainfall chart indicates. In 2009, the teams were able to walk an average of only 31 survey units per day due to inclement weather, as opposed to 41 units per day in 2011, despite a similar average number of team/days in field (15 and 16 respectively; see Chapter 8, Table 8.1 for survey progress details). Occasional

Figure 5.4 A spring snowfall during survey in the Kazanlak Valley.

snow showers and high winds contributed to miserable fieldwork conditions, mitigated only by fabulous photo opportunities (Fig. 5.4). Warm days in the spring time worsened the working conditions as they swelled the streams and softened the clayey ground causing access difficulties. Autumn proved more conducive to fieldwork. While the temperatures would plummet at night, the days were dry, sunny, and pleasant, with few surprises. The dry weather increased evaporation and the need for irrigation, both of which combined with limited late-summer and autumn rainfall to lower water levels of the Koprinka Reservoir, revealing stretches of previously submerged terrain. The dry autumn weather helped teams cover more ground, although they had roughly the same amount of daylight hours as during spring. Having walked an average of only 16 days in autumn 2011, we nonetheless doubled the intensive coverage of spring 2009. While the two spring seasons may not be representative of the local climate, autumn is preferable to spring for survey in Kazanlak.

5.4.2 Water

The Kazanlak Valley is well provided with water. Before the construction of the Koprinka Reservoir (also called the Georgi Dimitrov Dam) in 1955, one of the massive hydraulic engineering projects of the Communist era, the main freshwater source in Kazanlak was the Tundzha River (Reichsamt für Landesaufnahme 1940; Uzunov 1966, 283). At 350 km, the Tundzha River is the second longest river in Bulgaria after the Danube. It rises in the Stara Planina and flows through the Kazanlak Valley eastwards into the Thracian Plain. North of Yambol, it turns abruptly south and continues to Edirne (ancient Hadrianopolis), where it flows into the Maritsa River which drains into the northern Aegean Sea. The Tundzha River is fed by the runoff from the Stara Planina (>10 mm/sq km) and tributaries in the eastern Thracian Plain. Its average discharge rate is 38 cubic meters per second and the maximum flow occurs usually in April after the spring snow melt (Knight and Staneva 1996, 351, table 1). In the past, the river meandered through the Kazanlak Valley, but now many sections are channelised, dammed, and used for irrigation. The Koprinka Reservoir has the volume of 134 million cubic metres, which are used to generate electricity and irrigate over 45,000 ha of land within the irrigation network 'Stara Zagora' and the eastern part of the Kazanlak Valley (Uzunov 1966, 283; Varbanov 2002).

In the Kazanlak Valley, the Tundzha River is fed by dozens of streams that originate in the Stara Planina and transverse the valley from north to south, eroding gullies in the process (Fig. 5.5). Many of these streams are perennial, fed by rain and snowmelt from the mountains. As they join the river, these streams provide fresh water to the communities of the valley. Several streams originating from the Sredna Gora also join the Tundzha River.

Besides the Tundzha River and the mountain streams, Kazanlak has great water reserves in thermal aquifers. Suitable geological conditions for the formation and reproduction of deep, pure, drinkable water exist throughout Bulgaria. As the frequency of place names ending in *-banya* (bath) and *-chesma* (a tap or a well) suggests, mineral aquifers have been utilised for public taps or for balneological purposes for centuries. Kazanlak benefits from carbonate aquifer formations produced by neotectonic features in the Stara Planina as well as aquifer systems in the granite and silicate rocks of the Sredna Gora (Shterev and Zagorchev 1996, 400).

Given the abundance of water resources, the availability of water has not been a critical factor limiting human settlement. Indeed, although evidence is lacking for the Kazanlak Valley itself, water has been used for large-scale irrigation since 1400 (attested in the Maritsa Valley), and for industrial purposes like wool processing, dyeing, and fabric production since 1800 (in Gabrovo and Karlovo; *cf.* Knight and Staneva 1996, 354).

5.4.3 Soils

The soils in the Kazanlak Valley broadly fall into three groups, which form horizontal bands running from west to east (colour figure 2). Listing them from south to north, they include: cinnamonic forest soils (luvisols), alluvial or riverine soils (fluvisols), and deluvial soils (colluvisols or prolluvisols). The terms in parentheses are the standard FAO 1990 major soil group names, while the former are Bulgarian terms, based on Russian soil classificatory system (after Ninov 2002, 282–3, table 4.1). This correlation allows newer studies from other regions to be compared to results presented here. Throughout this volume, however, the Bulgarian terms are used, as they correspond to terms used in common soil and geological maps and databases and major soil type publications (see Chapter 7, 11: Koynov *et al.* 1968; Shishkov and Kolev 2014).

Cinnamonic forest soils are mostly found on the hills of Sredna Gora. They suffer from erosion and leaching. These soils contain little silt and clay and often have low phosphate levels and high acidity. Where pseudo-podsolisation has occurred, they are low in nitrogen, phosphates, and organic matter (Dennel and Webley 1975, 98).

Riverine soils can be found in a zone along the Tundzha River. Riverine soils originate from alluvial drift sediments and can be of sandy or clayey types. Where water flowed fast (due to gradient or width of the river bed), it deposited coarser sand particles, where it flowed slowly it deposited finer clay particles, occasionally leading to the formation of *smolnitsas* (vertisols) and chernozem-like heavy soils. As the Tundzha flowed, sandy particles accumulated at the bottom of the river bed, while finer fraction, heavier soils deposited on its banks where a lower gradient slowed the flow. Where the river meandered, deposition of the finer particles happened on the inside of meanders, and erosion of the exterior. In our study area, due to drowning of the river bed, clayey riverine soils are found mostly on old river terraces, especially along the northern bank of the Koprinka Reservoir.

Moving northward from the Tundzha River, deluvial soils dominate the valley floor all the way to the foot of the Stara Planina (Ninov 2002, 268–9). Deluvial soils are light and sandy, derived from hill deposits sorted by erosion. They are stony and well drained, while their coarse fraction depends on the rates of erosion and the gradient of the parent hillslope. The soils become progressively stony, with a large coarse fraction, as one travels north across the valley and close to the Stara Planina. Stony fields occur frequently in a 1.5–2 km band under the Stara Planina, except where the coarse deposit has been covered by deluvial sediment deposited by mountain streams. Mountain streams carrying silt and organic matter from the hills replenish these soils with nutrients on a regular basis. Used today for the cultivation of lavender, roses, and vines, they are considered less fertile than the heavier *smolnitsas*, but for pre-modern agriculturalists, deluvial soils would have been preferred because of their easy treatment with manual implements (Dennel and Webley 1975, 99–100).

The soil maps produced by the Japanese International Cooperation Agency (JICA) show pockets of gleyic deluvial soils between the foot of the Sredna Gora and the Tundzha River bed (colour figure 2). While not as extensive as in the valley floor, these too would have been attractive for early settled communities, not least because of the proximity of other soil zones and forest resources (Dennel and Webley 1975, 100).

5.4.4 Land use

Elevation has the greatest impact on vegetation in the Kazanlak Valley. The mountain slopes influence not only the average temperature, rainfall, and daily insolation, but also the quality and accessibility of soils, which determine their value to residents. Most of the valley floor has long been cleared for agricultural or pastoral purposes. The foothills and mountain slopes are covered by coniferous and mixed forest, transitioning into alpine meadows at about 1,100 m and stone fields at summits like Mount Botev (2,376 m) in the Stara Planina northwest of the valley (see Fig. 5.2).

The Kazanlak municipality includes a lot of mountainous terrain and, by modern standards, has relatively poor soil quality. As a result, land use is now equally divided between forestry (43.6%) and agriculture (43.4%). Dry perennial farming dominates agriculture, with fallow (grazing) land and irrigated fields representing a smaller fraction of the local economy. The Kazanlak municipality is urbanised (8%) to a greater extent than the Yambol province (3.3%), with the remaining 5% of land in the municipality used for water resources, mining, industry, transport, and infrastructure (*cf.* NSI 2015 'Regions', II-12).

Certain perennial crops thrive in the valley. Kazanlak has been renowned for cultivating the oil rose (*Rosa damascena*) and producing attar of roses since the eighteenth century (Fig. 5.6). During his exploration of oil rose production, Bruman called the valley 'the most extensive rose garden in the world' (1937, 20). Its cultivation remains emblematic of the valley today, as indicated by its nickname, 'the Valley of the Roses'. Other perennials are also grown. Lavender flourishes in the stony soils of the valley (Fig. 5.7), as do fruit, chestnut, and walnut trees. The beauty of mature orchards, as well as oak and elm groves, was noted by early travellers (Jireček 1888, 137, 145–6; Naval Intelligence 1920, 28). Besides these perennial (cash) crops, locals also grow vegetables and potatoes in gardens near their homes, as well as cereals, sunflowers, and maize, mostly on the

Figure 5.5 The profile at the Leshnitsa Creek (site 3122) showing erosion typical of the streams descending from the Stara Planina.

Figure 5.6 Rose fields in the Kazanlak Valley.

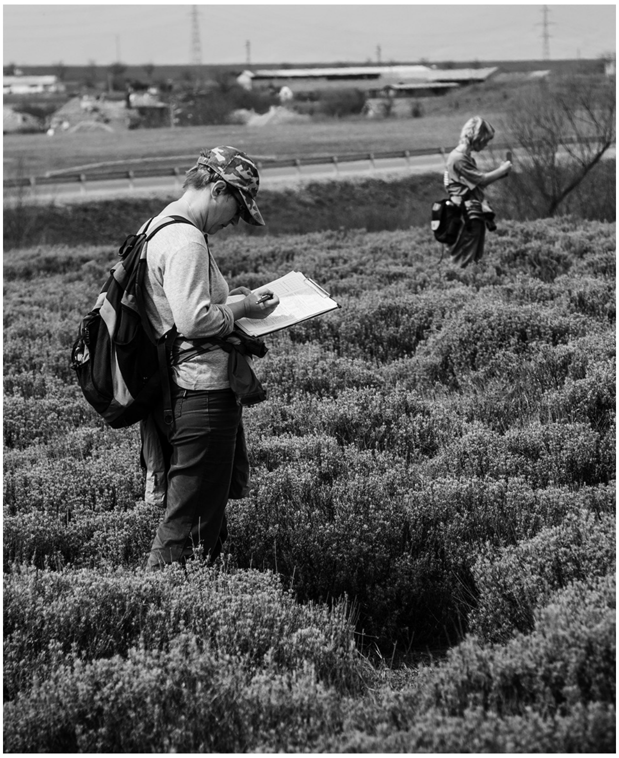

Figure 5.7 Lavender fields in the Kazanlak Valley.

higher quality soils on river terraces. Bruman (1937, 42) noticed tobacco, vines, and mulberry trees in the 1930s, but their cultivation appears to have declined. Vineyards are rare in comparison to other parts of Bulgaria but can be found on south facing slopes. We did not encounter any tobacco fields, but saw a lot of maize instead (Connor and Leeuwen 2012). Upon enquiry, the farmers informed us of a government subsidy for growing maize, which may have encouraged its production. The influence of agricultural zones is clear; meadows, vineyards, roses, lavender, orchards, and most other perennial crops are situated on the slopes around the perimeter of the valley, while grain, sunflowers, and other annual crops are found on the flats nearer the river. Many of the 6% of fallow fields are utilised as meadows and pasturelands for dozens of local shepherds and their flocks (Fig. 5.8). Having gathered sheep, goats, or cows from their villages, the shepherds take flocks on a daily trip around the valley's pastures and stubbly fields, trimming grass on the valley floor and clearing underbrush in the surrounding forests.

Forests cover some 44% of the Kazanlak municipality, including much of the Sredna Gora and Stara Planina. Many forests are farmed monocultures. The Stara Planina have more mature forests of spruce, fir, and pine, while the Sredna Gora host many deciduous trees, especially mature and scrub oak. On the valley floor, original forests have been replaced with walnut and fruit orchards. Isolated patches of coniferous monocultures have been planted on river terraces in the northwest part of the valley for recreational or industrial purposes.

Figure 5.8 A shepherd drives his flock from a village to pasture in the Kazanlak Valley.

Besides the great supplies of timber and firewood offered by the mountains enclosing the valley, sources of granite and limestone are also available in the Sredna Gora and Stara Planina, some of which show signs of past exploitation. These resources are relatively easy to access, even for pre-modern societies, as they are within 10 km of anywhere in the valley. While accessing and transporting stone (or other materials) from the Stara Planina would be a demanding undertaking (Fig. 5.9), the Tundzha River and its tributaries at the foot of Sredna Gora offer a convenient means of transport for both timber and stone resources.

In terms of modern land use and land divisions, most of the fields we walked during fieldwork were small (ca. 0.5–5 ha) or medium-sized (5–15 ha). Large tracts (over ca. 20 ha) were rare. Pastures and other fallow lands in the northern part of valley, however, stretched over large areas, as did scrub oak in the Sredna Gora and forests in the Stara Planina. All were unfenced and easily accessible on foot. While fences were rare, farmers nonetheless kept a close watch over their fields; we were often met

Figure 5.9 Rock outcrops overlooking a gorge in the Stara Planina.

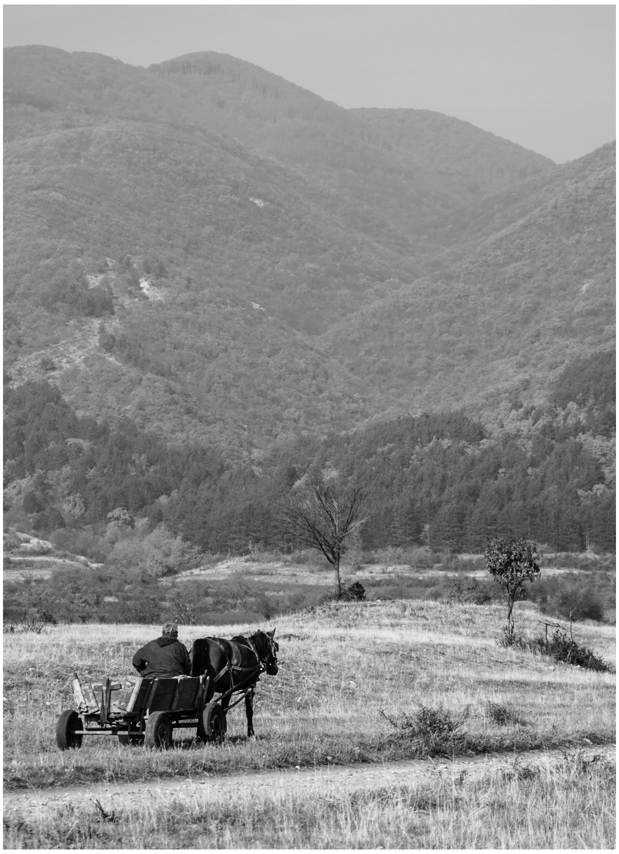

Figure 5.10 Kazanlak Valley landscape: note the burial mound in the right half of the image.

in the middle of a field and asked about our business. Gold panners and fishermen were a common sight on the banks of the Koprinka Reservoir and along larger streams. Horse carts and grazing horses were frequent sights on the grasslands in the upper parts of the valley (Fig. 5.10). Shepherds with flocks of sheep or goats, or herds of cows, were ubiquitous, regardless of elevation, slope, or remoteness. We encountered them in the middle of villages, on the banks of Koprinka Reservoir, and in the clearings in Sredna Gora or Stara Planina.

5.5 Conclusion

The Kazanlak study area offers diverse natural resources, located within a small area with a pleasant climate and adequate precipitation. Fertile alluvial terraces near the river and well-drained soils in the rest of the valley would have attracted early farmers. Good supplies of water, an abundance of grazing land, the proximity of forests for timber and firewood, and supplies of granite and limestone – all accessible within a day's walk of most places in the valley – provide an environment conducive to habitation by the first sedentary communities and their descendants. The island-like boundedness of the valley not only offered some security in the past, but makes Kazanlak an ideal space for archaeological investigation today. Given the valley's clearly delimited area of 300–400 sq km, it is likely that, for much of the pre-modern area, the population of the valley subsisted on local resources and produced cultural features such as settlements, burials, and other use areas, all within the spatial limits imposed by the surrounding mountains. Conducting surface survey within the valley should, therefore, provide a representative sample of the various classes of cultural remains produced by the inhabitants of the Kazanlak Valley (pending continued exposure and reasonable preservation) and allow an evaluation of their variability and relative frequency (Binford 1964, 430–1). Such an assessment is essential for the study of people's behaviour in the past, as it is reflected in the artefacts spatially and temporally distributed across the landscape.

6

A history of archaeological research in the Kazanlak Valley

Julia Tzvetkova, Nadezhda Kecheva, and Yulia Dimitrova

Abstract *Archaeological field surveys and excavations in the Kazanlak Valley began at the end of the nineteenth century. This chapter outlines the development of investigations in the region, tracing several stages in the emergence of new methodologies, especially the gradual replacement of informal surveys by systematic coverage and the registering of all types of sites from all chronological eras. Special attention is paid to the contributions of the researchers whose work revealed of the extent of Bulgaria's archaeological legacy.*

Keywords *Kazanlak Valley; historiography; systematic surface survey; history of archaeological research*

6.1 Introduction

The Kazanlak Valley holds a special place amongst the scientific interests of researchers in the fields of Thracian archaeology and history. The bibliography on the subject is extremely large due to the valley's rich archaeological and historical heritage and an extensive legacy of research. This review of archaeological research in the region is not a comprehensive historiographical overview. Instead, its goal is to review key trends and turning-points in archaeological prospection and survey, to synthesise the work done so far, and to suggest directions for future research.

Modern archaeological investigations in the Kazanlak Valley, as elsewhere in Bulgaria (see Chapter 2), began in the 1870s. Several phases are identified based on the methodologies and approaches favoured by researchers: (1) the latter half of the nineteenth century through World War II, (2) the 1940s through 1970s, (3) the 1970s through the fall of Communism, and (4) 1990 to the present.

6.2 The later nineteenth century to the 1940s: the accumulation of initial data

The first modern, systematic archaeological research in Bulgarian lands began in the latter half of the nineteenth century and accelerated after Bulgarian liberation from the Ottoman Empire in 1878. These investigations were purposive and usually produced bare descriptions or simple statements of particular types of prominent archaeological features: tells, other settlements, fortresses, burial mounds or 'flat' burials, necropoleis, and single finds brought to light by accident or looting. On rare occasions, these descriptions included additional information such as site chronology, approximate dimensions, a short description of the site or selected artefacts, and sometimes a rough sketch. Monuments with clearly visible surface remains, like burial mounds or fortresses, attracted the most attention. Local toponyms, reflecting distant memories or remaining traces of 'old things', were used as clues to the location of archaeological sites; localities named Gradishteto Hill ('The Fort'), for example, sometimes indicated the remains or memory of a pre-modern fortress nearby.

Burial mounds were – and remain – the most characteristic and prominent archaeological features in Bulgarian lands, and the earliest maps and descriptions focused on them. The second half of the nineteenth century saw the first attempts to map burial mounds. In a short report from 1871 in the *Anthropologische Gesellschaft in Wien* the French geologist Ami Boué made perhaps the first attempt to count some mounds, as a part of a research program that sought to cover the entire Balkan Peninsula (Boué 1871). It was the Austro-Hungarian scholar Felix Kanitz who conducted the first archaeological survey during his journeys in Bulgaria between 1860 and 1879 (Kanitz 1882). Some of his observations were outlined in a study describing the height, count, and associated artefacts from some burial mounds in northern and southern Bulgaria, published in 1876. The study includes brief information about burial mounds along the Tundzha

River and in the Kazanlak and Maglizh regions (Kanitz 2012, 43–5). In 1878–79, during the Provisional Russian Administration in Bulgaria after the Russo-Turkish war, Russian topographers prepared a map of Bulgarian lands that included burial mounds. According to this map, some 134 burial mounds were known in Kazanlak region at that time (Škorpil and Škorpil 1898, 19). These early investigations, only some of them specifically archaeological, provided a map and inventory of burial mounds, often with brief descriptions.

Around the turn of the twentieth century, the brothers Karel and Hermenegild Škorpil undertook the first thorough archaeological study of burial mounds, one which incorporated earlier research but also included more extensive discussion. In their 1898 book *Mogili* ('Mounds'), the Škorpil brothers provided more detailed information about particular burial mounds situated in the settlement neighbourhood of Kazanlak, Shipka, Maglizh, Gorno Cherkovishte, Tarnichene, *etc*. (Škorpil and Škorpil 1898, 10–18). They speculated on the origins and meaning of local names for some prominent burial mounds associating, for example, the name *Ostrosha* near Shipka town with its shape (*ostar* means 'sharp' or 'peaked' in Bulgarian), and the name *Shyushmanets* with a local legend according to which the Bulgarian Tsar Ivan Shishman was buried in the mound (Škorpil and Škorpil 1898, 17, 38).[1]

The Škorpil brothers also reported unusual finds and features discovered by accident or looting in some of the mounds. Several such features came to light in the Shipka region during the late nineteenth century. Near Shyushmanets, a burial mound with stone lined cist grave was unearthed, containing a human skeleton, a bow, and arrows. They also described the so-called *Ploskata Mogila* ('The Flat Mound') as containing 'foundations of a building, plastered with marble slab stones and large human bones and two bracelets'. Likewise, the Škorpil brothers report cist and brick graves in burial mounds and a large bronze vessel with ashes inside, probably a cremation burial, all near Shipka (Škorpil and Škorpil 1898, 35, 39, 67, 164). Although sometimes frustratingly general or incomplete, the information provided by the Škorpil brothers is the best available from the time, and it implies a high concentration of rich graves in the Kazanlak Valley.

The fortresses situated in the Stara Planina and Sredna Gora represent a second type of monument that drew the attention of early investigators in the late nineteenth century (Jireček 1974). Again, the Škorpil brothers present the best available descriptions of particular sites, providing information about four fortresses between Shipka and Dolno Izvorovo (formerly Dolno Gyuzovo), the largest of which is *Karni*, now known as Kransko Kale (Škorpil and Škorpil 1898, 39–41).

In the beginning of the twentieth century, investigations of various types of archaeological sites in Kazanlak Valley intensified, simultaneously becoming much more professionally conducted. Some of the leading Bulgarian archaeologists and historians at that time paid special attention to the fortresses and churches in the Stara Planina near the villages of Manolovo, Kran, Enina, or Skobelevo, and on the slopes of Sredna Gora near Tazha, Buzovgrad, Alexandrovo, Turiya, and Viden (Filov 1913a, 338; Miyatev 1922, 264–77; Kazarov 1924, 75). An important accidental find of several votive plaques of the Thracian Horseman, originating from the Apollo sanctuary near Viden village (Kazarov 1924, 75–80), provided early evidence for the continuation of Thracian religious practices into the Roman period.

Throughout the late nineteenth and early twentieth centuries, most archaeological investigations were focused on the historic periods, or types of remains that were clearly visible on the surface. Beginning in the 1920s and 1930s, however, the prehistoric era became a subject of scientific interest, starting with the investigations of Vasil Mikov. These include reports on a small Chalcolithic tell situated in the village of Gabarevo, which was destroyed in 1928 by the construction of a local school building (Mikov 1933b). In a small booklet, part of the series *Materials for the Archaeological Map of Bulgaria*, he provided some general information about the prehistoric era in the Kazanlak region, based on materials acquired in the museums from Kazanlak tell, Srednogorovo tell, and Rozovo tell (determined in 2012 to be a flat settlement on a natural hill rather than a tell), as well as from isolated finds from the territories of Dolno Sahrane, Tarnichene, and Cherganovo villages (Mikov 1933a, 50, 77, 82, 109, 134; *cf.* Tabakova-Tsanova 1991, 121, for the discovery of Cherganovo tell).

The first phase of archaeological investigation in the region ended with a sensational discovery, which determined from that moment the extraordinary place of the Kazanlak Valley in Bulgarian archaeology. In April 1944, while digging a trench in what was thought to be a natural hill in Tyulbeto locality in the northeastern part of Kazanlak,[2] soldiers accidentally found a brick tomb – the now famous Kazanlak Tomb. The well-preserved Hellenistic frescoes in the tomb were unique in Thrace at the time, provoking intense scientific interest. The discovery inspired a series of publications about various aspects of the Kazanlak Tomb in subsequent decades: its date to the late fourth/early third century BC, the architectural design, the iconography of the frescoes, the funerary rite of the burial, *etc*. (Mikov 1954; Vasiliev 1958; 1974; 1991; Dimitrov 1966; Venedikov and Gerasimov 1973, 67–70; Jivkova 1974; Ognenova-Marinova 1991; Ruseva 2002, 157–8; Vassileva 2005, 125–56; Parvin 2015). Since 1979 it has been listed as a UNESCO World Heritage Site and continues to interest researchers.

6.3 The late 1940s to the 1970s: the beginning of systematic research

The outset of the second research stage dates to the late 1940s and marks the beginning of systematic archaeological

investigations in the region. A major discovery in this period was the Thracian city of Seuthopolis, whose investigations influenced not only the local archaeological research but all Thracian archaeology in Bulgaria.

In late 1940s, the political authority of the early Communist regime in post-war Bulgaria planned the construction of a new dam, situated where several smaller rivers join the Tundzha River. The Koprinka Reservoir that the dam would create threatened nearby archaeological sites, especially those located on the lower and more gradual bank on the north side of the river.

Between 1948 and 1954, dam construction instigated one of the largest archaeological rescue campaigns in Bulgaria to that time. Excavation of the endangered sites was organised by Professor Dimitar P. Dimitrov. For seven archaeological field seasons, a large Early Hellenistic centre dating from the late fourth through the mid-third century BC was located and fully excavated (Dimitrov and Čičikova 1978; Dimitrov and Penchev 1984; Dimitrov *et al.* 1984). An inscription found during the excavations identifies the site as the previously unknown fortified Thracian city of Seuthopolis. Many well-known Bulgarian specialists participated in the excavation team: Maria Čičikova, Lyuba Ognenova-Marinova, Ana Balkanska, Kiril Zhuglev, and Gergana Tabakova-Tsanova, who have spent their professional careers revealing different aspects of Thracian culture (*cf.* Čičikova 1957; 1970; Zhuglev 1952; Tabakova 1959a; 1959b; Tabakova-Tsanova 1961a; 1961b; 1979; 1980; Čičikova and Lilova 1983; Ognenova-Marinova 1991). The excavations became a major field school for a generation of Bulgarian archaeologists (Dimitrov *et al.* 1984, 7).

The investigations of the reservoir also included an adjacent mound necropolis. Between 1948 and 1949, three mounds located between the Golyama Varovita and Tundzha Rivers were excavated, revealing two brick graves and two brick tombs with round chambers, dating to the end of the fourth or the beginning of the third century BC (Zhuglev 1952; Čičikova 1957; 1970, 7–18; Čičikova and Lilova 1983; Getov 1991a, 40–4; Lilova 1991, 47–54).

After the excavations finished, the reservoir flooded the entire investigated area. Under its deep water now lies the only known Odrysian capital. Some may judge the act as a major loss for Thracian archaeology, even though the city is not destroyed but only buried for future generations. Regarding the political situation in Bulgaria of 1940s–1950s, unfortunately we have to say there were no possibilities for stopping or changing the dam construction: the dam was initially named 'Georgi Dimitrov', after the leader of the Bulgarian Communist party, and like most of the things from that period it was thought to be for the good of the people. Today it bears the name 'Koprinka Reservoir', after a nearby village. The discussion about re-discovering Seuthopolis and bringing it out of the waters recurs with varied intensity in public space (*cf.* http://sevtopolis.suhranibulgarskoto.org/en_obekt.php), but its implementation will remain a future task.

One of the main local organisations researching the archaeological heritage of the valley was the 'Iskra' Historical Museum in Kazanlak, which was established during this period. Its first director was the Bulgarian humorist-writer, and native history researcher, Dimitar Chorbadzhiyski, better known by his pseudonym Chudomir, born in the nearby village of Turiya. His deep interest in the history and archaeology of the region led him in the 1930s to perform small amateur excavations (the only ones until now) on Visok peak near his home village of Turiya, providing additional information about the existence of the fortress there (*cf.* Velkov 1935, 464). His short stories and journals for the period 1947–67 contain valuable information about local history, ethnography, and many archaeological sites (Chudomir 2004). Writing in his customary, casual manner, he provides vivid personal insights into the excavations of Seuthopolis, the personalities of famous Bulgarian archaeologists who visited Kazanlak, and the day-to-day workings of the museum. Describing the results of a survey near Enina village, Chudomir mentions the creation of 'a small archaeological map of the village', finishing the description with the sentence: 'I must have such a map for all villages' (Chudomir 2004, Diary for 1954, 27 March). Chudomir's major contribution is the reshaping of the museum from a simple local archaeological collection to a leading public and scientific institution in Kazanlak. Having considered the need for a person responsible for managing of the constantly growing archaeological data and finds in the museum archives, Chudomir appointed Gergana Tabakova, who began her career at the museum as Chudomir's assistant.

As an archaeologist, and later as a Director of Iskra Museum, Tabakova-Tsanova devoted 30 years of her life to studying, recording, and protecting the archaeological legacy of the region. Her activity from the 1950s through the 1970s produced a great body of knowledge about sites, features, and finds.

Some of Tabakova-Tsanova's principal contributions are the excavations of three important Roman sanctuaries of the Thracian Horseman in the region. In 1955, she partly excavated the previously known sanctuary of the Thracian Horseman near Viden (Kazarov 1924, 75–80; Tabakova-Tsanova 1961b; 1980, 176–7; *cf.* Ivanov 1994; Ivanova 2008). During the 1950s and 1960s, two other sanctuaries of the Thracian Horseman, with epithets Apollo *Zerdenos* and Apollo *Teradeenos*, were discovered near Kran (see also Chapter 21). Excavations indicated that both dated between the latter half of the second century and the mid-fourth century AD (Tabakova 1959a; Tabakova-Tsanova 1980). Subsequent excavations in the 1970s revealed further elements of related architectural complexes. Near the sanctuary of Apollo *Zerdenos,* an

Early Byzantine basilica was found (Tabakova-Tsanova and Ovcharov 1975), and in the vicinity of the sanctuary of Apollo *Teradeenos,* a large building dating between the second and fourth century AD and a small Early Byzantine church with a baptistry were discovered (Ovcharov 1977; Tabakova-Tsanova 1980, 174). Initially the building was defined as a villa rustica, but recent studies have indicated that it is more likely a household of a wealthy resident of a nearby *vicus* (Dinchev 1997, 99, 101).

The expansion of Koprinka Reservoir prompted the next excavations in 1960, under the supervision of Lyudmil Getov, a newly appointed archaeologist in the 'Iskra' Historical Museum in Kazanlak, where he worked until 1971. His work is associated with the excavations of several important sites from different chronological periods – the other Seuthopolis necropoleis (Getov 1961; 1982), Bronze Age burials near Dolno Sahrane village (Getov 1965), and some from the Roman period (Getov 1969), and the Hellenistic Maglizh Tomb (Getov 1988). A long-standing interest in the Late Iron Age and Thracian culture, shaped by his experience in Kazanlak, influenced his further academic career as one of the most prominent Bulgarian archaeologists, leading for years the excavation of Kabyle – the next major Thracian city after Seuthopolis.

Investigations of prehistoric sites intensified during this phase. In the years 1967–71 and 1973–74, rescue excavations were undertaken on the Kazanlak tell, situated in the modern 'Bulgaria' factory in the town (Mikov 1933a, 77, #31; Katincharov 1969; Georgiev 1972; 1974, 6–7). The tell was completely excavated, though the results have never been published in any special volume. Recent evaluation of the acquired materials shed more light on site specifics and chronology. The researchers distinguished seventeen building levels from the Neolithic, single traces from the Chalcolithic, and subsequently four Early Bronze Age building levels (Georgiev 1972; Leshtakov 2005, 442; Nikolov 2010, 319, n. 1). Modern analysis of excavation data allows specification of EBA site characteristics, with the suggested reinterpretation of the alleged fortification enclosure ditch as the ditch of a rondel type sanctuary (*cf.* Leshtakov 2005; Nikolov 2008; 2010).

Along with the numerous excavations, the archaeologists started to pay attention to other non-destructive methodologies for site recording. During the 1960s, one of the first detailed archaeological surveys of Mediaeval fortifications in the Stara Planina and Sredna Gora was undertaken (Popov 1982). All visible surface remains were recorded and drawn, including precise measurements of size and location. For some of the largest fortresses, such as Chilechito near Enina, Kaleto and Gradovete near Kran, Kaleto near Manolovo, and Osetenovo, more precise plans were also created using a theodolite (*kale*, *gradishte*, and *Gradovete* all mean 'fortress', and are incorporated in many local toponyms). All told, Popov registered 23 fortified sites in the Kazanlak Valley, 18 on the southern slopes of the Stara Planina, and five on the northern slopes of the Sredna Gora.

The first geophysical surveys of burial mounds were conducted during the 1960s. In 1965, Italian geophysicists examined several burial mounds in the Kazanlak region, followed by excavations. Tombs were discovered in two of them, the famous Maglizh Tomb from the second half of the third century BC (Tsanova and Getov 1973; Getov 1988, 1991, 40–4), and Kran I Tomb dating from the end of the third to the beginning of the second century BC (Getov 1991a, 40–4; Ruseva 2002, 119). Excavations of the mound later called 'Svetitsa' did not produce results (Tsanova and Getov 1973; Kitov 2005a, 47; 2005c; 2008, 142; Tonkov 2007).

Besides the systematic investigations and excavations, archaeologists from the Iskra Museum continued documenting accidental finds and demolished graves. Data gathered, *e.g.*, for the regions of Cherganovo, Skobelevo, and the Konsulova mound near Alexandrovo, illustrate funerary practices during fourth century BC and the Roman period in the region (Tabakova 1959b, 88; Tabakova-Tsanova 1991, 122; Batsova 1960, 47–51). Likewise, accidental coin finds have been carefully recorded (Gerasimov 1937; 1943a; 1943b; 1950; 1952; 1955; 1962; Changova 1959). The collected information for some dispersed finds is sometimes all that survives. The numerous finds, dating from the fifth century BC through the Ottoman period, speak for the contiguous and intense habitation of the region.

6.4 The 1970s to the 1990s: the first analytical stage

Although a definite boundary of this new stage of investigations in the Kazanlak region cannot be precisely defined, one major event affected Thracian studies in Bulgaria as a whole. In 1972 the Institute of Thracology at the Bulgarian Academy of Sciences was established. For the next two decades it played a central role in scholarly studies of Thracian culture, initiating large-scale field surveys in different parts of the country.

In the Kazanlak Valley, some of the first sophisticated archaeological surface surveys were organised by the Institute in the early 1970s. These surveys aimed to map and record all sites in the region, combining legacy data and new research. Aligned interests led to collaboration between Tabakova-Tsanova and Mieczysław Domaradzki, a young Polish archaeologist and new member of the Institute of Thracology. Gathering, systematising, and synthesising information from excavations, field surveys, and oral reports were important to both of them, and their research underpins the archaeological map of the Kazanlak Valley.

Recognising the need for systematic and well executed archaeological prospection, Tabakova-Tsanova and Domaradzki started an intensive surface survey program in 1973, which continued until 1978, focused mainly on

the western part of the valley. They combined fieldwalking with trial excavations. Many new archaeological sites from various historical periods were discovered during these campaigns (Tabakova-Tsanova 1991; Domaradzki 1991; 1994a).

The investigations of Domaradzki in the Kazanlak Valley were prompted by his interests in Thracian culture of the Late Iron Age. A special focus of his research was the evolution of settlement patterns both before and after the founding of Seuthopolis (Domaradzki 1991, 137). Amongst his first archaeological investigations in Bulgaria were those in the Kazanlak Valley during 1973. Together with Tabakova-Tsanova, he excavated a Late Hellenistic and Early Roman mound necropolis and related settlement near the modern village of Tazha (Domaradzki 1994a). Since the discovery of Seuthopolis, these were the next largest excavations of Late Iron Age sites in the valley. Domaradzki's field surveys and examinations of the archaeological materials held by museums allowed him to suggest more precise dates for some known sites, and to synthesise the settlement system during the Late Iron Age. He distinguished two site concentrations: one near Seuthopolis and another in the eastern part of the valley (Domaradzki 1991, 130).

Investigations on sites from the Mediaeval period also continued. In 1983–1984 archaeological excavations were carried out on Gradovete fortress near Kran, revealing architectural remains of a Late Antiquity and Early Byzantine fortress, as well as older material from the Early Hellenistic period (Nikolov *et al.* 1984; 1985).

Kaleto near Kran and Kaleto near Manolovo were then partly excavated (Popov 1982, 6; Gatev, Yankov and Karanikolova 1980, 222), indicating that the fortresses were in use since Late Antiquity (*cf.* Gatev, Yankov and Karanikolova 1980, 222; Popov 1982, 6, 65–6, 89–90). In 1979 excavations began in the foothills below Kaleto, revealing an associated Mediaeval necropoleis and a settlement (Mediaeval Kran) dating to the thirteenth–fourteenth century AD (Gatev, Yankov and Karanikolova 1980). The studies continued later during 1988–1989, confirming the date of the Mediaeval town Kran (Stefanova 1989; Stefanova-Georgieva 1990).

6.5 The 1990s and after: the modern stage

Political changes in Bulgaria after 1989 prompted intensification of archaeological surveys in the Kazanlak Valley. In 1990, an automated information system known as the 'Archaeological Map of Bulgaria' (abbreviated in Bulgarian as AIS AKB, *cf.* Chapter 2) was established under the supervision of Domaradzki, who, as already mentioned, was instrumental in the modern shaping of the Archaeological Map of Bulgaria. The AIS AKB played a major role in subsequent years, becoming the official archaeological heritage registry for Bulgaria. In 1996 and 1998, Domaradzki continued field surveys in the region, focused on gathering data for the AIS AKB. These investigations concentrated on the eastern parts of the valley and involved Georgi Nekhrizov. Nekhrizov's research interests in the Thracian culture of the first millennium BC and field survey experience led him to become responsible for the development of AIS AKB. The sudden and unexpected death of Domaradzki in 1998, shortly after the end of the 1998 Kazanlak field campaign, brought a halt to both systematic field surveys and planned archaeological excavations of newly discovered settlements for more than 10 years.

Long-term archaeological research in the Kazanlak Valley through the early 1990s left a rich legacy of data. An estimated 920 burial mounds were known at that time, concentrated in the western part of the valley (Domaradzki 1991, 133).[3] As of the mid-1990s, only some of them had been excavated. This picture changed drastically with the initiation of investigations by Georgi Kitov. For more than nine years (1992–1997 and 2004–2006), he led the 'Thracian Expedition for Tumular Investigations' (abbreviated in Bulgarian as TEMP), which dismantled and examined numerous burial mounds (Kitov 2005b). In the process, rapid excavation using heavy machinery led to the discovery of 15 major, often spectacular Thracian tombs and funerary structures, mostly from the Hellenistic period (Table 6.1). All have now become symbols of Thracian culture in the hinterland of Seuthopolis.

The excavated sites were situated in different parts of the valley, but the work occurred mainly in the north, at the foot of the Stara Planina in the vicinity of Kran, Shipka, Sheynovo, and Skobelevo, where a large concentration of extremely large burial mounds existed. The excavation

Table 6.1 Burial mounds excavated by G. Kitov and colleagues

Excavation year	*Mound name*	*TRAP code*	*Reference*
1992	Malkata mound	3215	Kitov 2005a
1993	Ostrusha	3255	Kitov 1993; Valeva 2005
1995	Slavchova mound	3397	Kitov 1996c
	Sashova mound	3212	Kitov 1996b
	Sarafova mound-Kran II	4111	Kitov 2005a, 16, 26
	Golyama Arsenalka	3210	Kitov 1996a
1996	Shushmanets	1038	Kitov 1999
	Griffins' tumulus	1040	Kitov 2003
	Helvetia	1039	Kitov 1999
2004	Golyama Kosmatka	3260	Dimitrova 2015
	Svetitsata	1045	Kitov 2005c
	Nanina		Kitov 2005a
	Fartunova		Kitov 2005a
	Kesteleva		Kitov 2005a

results were published only in brief reports, according to which the total number of the excavated mounds was over 130, including more than 60 in 1995 alone (Kitov 1996d). Details of structures, features, and finds were published only for the key sites, where monumental tombs or other rich grave complexes were discovered. Evidence from the other, 'minor' sites was scarcely mentioned, and what has been published was dispersed across many articles of Kitov and his team. Much remains unpublished or is in preparation.

A particularly controversial point is the early, pre-Hellenistic date of most of the large burial complexes originally proposed by the excavator. Other researchers argue a later one, within in the Early Hellenistic period, which appears much more reasonable with respect to the finds (Stoyanov and Stoyanova 2011).

Rescue excavations at other burial mounds have also been performed recently. As a result of salvage excavations, Nekhrizov unearthed two further tombs, one near Dolno Izvorovo village in 2009 (Nekhrizov and Parvin 2011), and another near Buzovgrad village in 2012 (Nekhrizov 2013; Krasteva and Nekhrizov 2014). Rescue excavations in the large necropolis situated between Yasenovo, Skobelevo, and Dolno Dryanovo villages were also carried out, revealing 10 smaller burial mounds with graves from the Hellenistic period (Nekhrizov, Parvin and Kecheva 2013). Recently, a brick grave, similar to those in Seuthopolis, was excavated in a looted and almost demolished mound near Pavel Banya (Parvin 2014). These mound excavations, together with the publication of the late Kitov's full results, will represent a firm basis for understanding Thracian funerary rites from the Early Iron Age through the Roman period in the Kazanlak Valley.

Detailed investigations of prehistoric sites have continued over the past 20 years. In 2003 Vasil Nikolov began excavations at the Kran tell. These continued with some interruptions until 2009. The uncovered traces of houses and ritual structures provide important data on the habitation and funerary rites from the Late Neolithic period and Early Bronze Age 3, stage 'Sv. Kirilovo' (Nikolov and Karastoyanova 2004; Nikolov, Andreeva and Anastasova 2005; 2006; 2010; Andreeva 2007; Nikolov 2009).

6.6 Conclusion

This outline of archaeological investigations in the Kazanlak Valley demonstrates the evolution of investigation methodology from local research enthusiasm to modern systematic approaches, which combine the potential of existing data with excavations and non-destructive investigations.

The discovery of the Kazanlak Tomb and the Thracian city of Seuthopolis biased archaeological inquiry, privileging investigations of Thracian culture from the Late Iron Age and Hellenistic period, though other periods, such as the prehistoric and Mediaeval eras, have generated constant research interest. Despite the extremely interesting discoveries of the three sanctuaries of the Thracian Horseman, suggesting the special role of the valley in Roman times, this period remains somehow neglected in modern research in the region.

Regarding survey methodology, the initial attempts to record archaeological heritage included only rough mapping of visual surface remains, or thematic and small-scale field surveys. After the 1970s, and especially after the AIS AKB was established (*cf.* Chapter 2), total and systematic field survey, mapping traces from prehistory through the middle ages, became the norm.

With some notable exceptions, excavations in the Kazanlak Valley were usually conducted as regular, planned research investigations rather than rescue operations. The region is situated far from modern infrastructure projects. The one major exception is the construction of the Tundzha River dam and Koprinka Reservoir, which submerged the only known Odrysian capital, Seuthopolis. Changing circumstances after 1990, especially the increased looting of burial mounds, necessitated rescue excavations, undertaken mostly by Kitov. Unfortunately, the rich graves discovered through rescue excavations provoked additional looting, which led to more rescue excavations, creating a vicious cycle. This will only be stopped by the creation of an informed and responsible society that values its cultural heritage.

In comparison to burial mounds, excavations of settlements have been rare and small-scale (excluding rescue excavations at Seuthopolis in the late 1940s and early 1950s). This is not surprising, since the burial mounds are thought to outnumber settlements and other site types by a significant margin. The imbalance, however, suggests a future direction for archaeology: the systematic investigation (survey and excavation) of the settlements that must have existed to produce the burial mounds. In this way, a more comprehensive understanding of evolving habitation systems in particular, and archaeological heritage more generally, might be acquired.

Notes

1 Ivan Shishman (1371–1395) was a Mediaeval Bulgarian tsar in Tarnovo, during whose reign Bulgaria was captured by the Ottomans. As the last Bulgarian Tsar, he is popular in Bulgarian folklore, generally associated with fierce fighting against the Ottomans, and his name is often associated in local legends with archaeological features (Andreev and Lalkov 1996, 287; Kaloyanov 2000). Concerning the name variants of *Ostrosha* and *Shyushmanets* listed in Škorpil, after Kitov's excavations of both mounds (see below), they became known in the scholarly literature as *Ostrusha* and *Shushmanets*, slightly changing the initially mentioned names.

2 A Bulgarian corruption of the Turkish word *türbe* (the tomb or mausoleum of a sultan or other high-ranked noble). *Tyulbe* is a common Bulgarian toponym. The name *Tyulbeto* in Kazanlak originated from the family tomb built there in the seventeenth century in which, according to the local oral tradition, Osman Pasha, the founder of Kazanlak, was buried (Jivkova 1974, 19).

3 Research since 2009 indicates that the number of burial mounds in the valley is still higher.

7

Surface soil survey in an archaeological context: the Kazanlak Geoscience Project

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Abstract *Quantitative soil data and erosion modelling can provide valuable insights into the preservation of archaeological materials and the environmental factors influencing patterns of pre-modern habitation. Existing soil datasets available to archaeology projects are frequently qualitative, however, or provide poor spatial resolution. This chapter describes the Kazanlak Geoscience Project (KGP), which aimed to address this lack of adequate data by conducting a systematic landscape-scale soil survey across the Kazanlak Valley as part of the 2011 Tundzha Regional Archaeology Project (TRAP) field season. The sub-project collected 155 soil samples across 215 sq km and tested for soil texture, coarse fraction, organic matter, carbonates, and geochemistry. This information was combined with topographical and land cover datasets to produce quantitative RUSLE and USPED soil erosion and deposition models. The results predicted erosion rates of between 0–388* t ha^{-1} yr^{-1} *(median 2.74* t ha^{-1} yr^{-1}*), while spatially precise KGP datasets provided a quantitative basis for future analyses relating soil properties and erosion to archaeological site selection and taphonomy.*

Keywords *geoarchaeology; soil survey; soil erosion; geochemistry; XRF; RUSLE; USPED*

7.1 Introduction

> Soils are indicators of the nature and history of the physical and human landscape; they record the impact of human activity and they reflect the environment and record the passage of time.
>
> (Holliday 2004, 1)

Soil properties reflect the processes that formed them, indicating past environmental conditions and the impact of human activity (Limbrey 1975). Study of sediments and soils can reveal the environmental context of past settlement patterns (Wilkinson 2005), the impacts of changing land use (Walling 1999), and the deterioration of the archaeological record over time (Zangger *et al.* 1997; French 2003). Soil erosion also contributes to land degradation, with Bulgaria being a good example (Kolchakov *et al.* 2005; Rousseva *et al.* 2006a; Shishkov and Kolev 2014). Erosion patterns may influence the location of settlements, and strongly affect the discoverability and distribution of archaeological finds (Wood and Johnson 1978; Ammerman and Schaffer 1981).

Physical and chemical properties of soils and sediments influence the erosion potential by controlling the permeability to water and the capacity to resist detachment and transportation by rainfall and runoff (Wischmeier and Mannering 1969; Bahadur and Badruddin 1990). Over the past 40 years, complex models including the Universal Soil Loss Equation (Wischmeier and Smith 1978), Revised Universal Soil Loss Equation (RUSLE; Renard *et al.* 1997), and Unit Stream Power-based Erosion Deposition (USPED; Mitasova *et al.* 1996) have been developed to relate soil properties and geomorphological conditions to quantitative estimates of erosion or deposition. Recently, the increased availability of geographic information system (GIS) software has allowed these calculations to be applied in three dimensions using continuous spatial soil property datasets (rasters). This approach can allow potential rates of erosion or deposition to be rapidly and accurately predicted across large geographic study areas (Van der Knijff, Jones and Montanarella 2000; Cebecauer and Horfierka 2008; Kouli, Soupios and Vallianatos 2008; Bathrellos *et al.* 2014).

Although spatial soil property maps and erosion modelling for Bulgaria exist (*e.g.*, Koynov *et al.* 1968; Koynov 1973: Boyadzhiev 1994; Rousseva *et al.* 2006b), these offer low spatial resolution and do not provide

the quantitative geographic soil property data required to accurately model soil erosion at scales relevant to the Tundzha Regional Archaeology Project (TRAP) or similar landscape-scale archaeological projects. To improve the accuracy and resolution of existing soil data and increase current understanding of the environmental factors influencing the region's archaeology, the Kazanlak Geoscience Project (KGP) undertook a systematic and spatially dense landscape-scale surface soil survey across 215 sq km of agricultural land, pasture, orchards, and forested foothills in the Kazanlak Valley during the autumn 2011 TRAP field season.

The soil property data collected during this season were used to address two primary research objectives: 1) produce high resolution, spatially explicit datasets depicting variation in physical and chemical soil properties related to fertility and erosion, and 2) combine these soil property datasets with geomorphological data to quantitatively model erosion and deposition potential across the entire Kazanlak Valley.

7.2 Methods

7.2.1 Field sampling

Within the 215 sq km Kazanlak Valley study area (Fig. 7.1), 197 target locations were identified through systematic random sampling (Orton 2000). This approach randomly assigned a sample site within each square of a 1 sq km grid covering the study area to eliminate selection bias and ensure all parts of the study area were adequately sampled. A minimum distance of 150 m was enforced between all samples, and urban areas and water bodies were excluded.

Over three weeks, 200 g of soil was collected at approximately 20 cm depth from each sampling site (Fig. 7.2). Each site was photographed, a Global Positioning System (GPS) point was taken, and vegetation type and density, land use, elevation, and aspect were recorded. A field test of soil texture was conducted on site and subsequently compared with laboratory texture tests. Where the chosen sampling sites were inaccessible or unrepresentative, new locations were randomly assigned

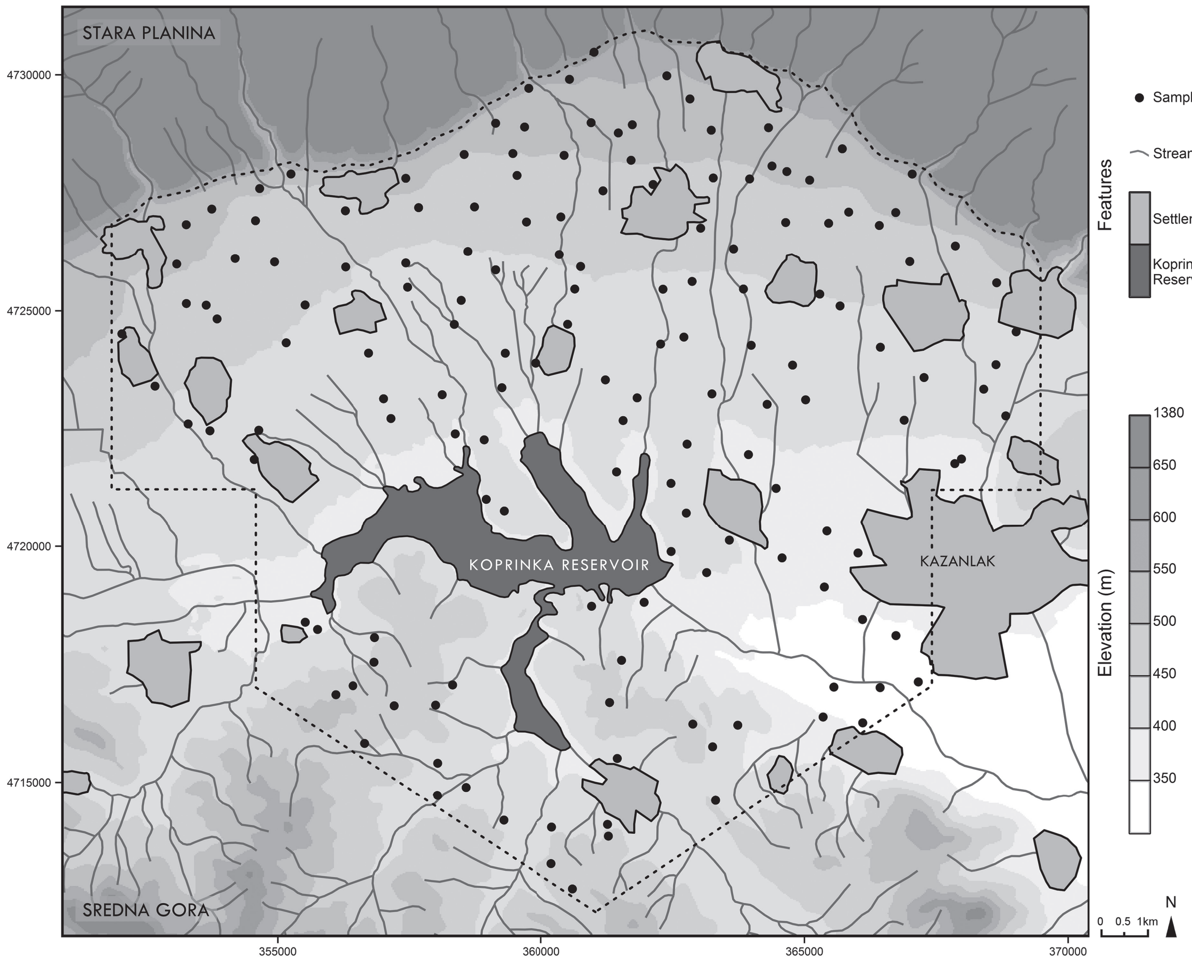

Figure 7.1 Black dots indicate sample locations for soil analysis in the Kazanlak Valley. Dashed line indicates boundary of study area.

in the field with ESRI ArcPad using an approach mirroring the initial allocation of sites. Forty-two grid squares (mostly in mountainous or heavily forested terrain) proved inaccessible despite attempts to reassign sample sites, reducing the final site count to 155 (Fig. 7.1).

7.2.2 Soil testing

Field and laboratory testing of soils (Figs. 7.2 and 7.3) focused on four characteristics: texture, coarse fraction, organic matter content, and presence of carbonates. Texture refers to the size of soil particles in constituent sediments, which are generally classified into three particle size classes: clay (0–0.002 mm diameter), silt (0.002–0.05 mm), or sand (0.05–2 mm; USDA 1993). Loam, for example, contains a relatively even contribution from each of the three size classes. Soil texture affects soil drainage, the availability of minerals to plants, and the soil's potential for erosion by water (Renard *et al.* 1997; FAO 2006). The TRAP team produced qualitative soil texture descriptors using a feel test conducted in the laboratory, based upon the United States Department of Agriculture (USDA) guidelines for soil texture classification (USDA 1993).

Coarse fraction is the portion of solid particles in a soil that are greater than 2 mm in size (larger than sand). In addition to hampering mineral uptake by plants, a high coarse fraction can affect soil erosion through two countering mechanisms: by decreasing the subsurface permeability of a soil which causes an increase in soil loss caused by flowing water, and through the 'armouring' effect of rock fragments on the soil surface which reduces soil detachment by rainfall (Römkens *et al.* 1997; Poesen, Torri and Bunte 1994). The angularity of coarse particles can be used to study prior erosion and age of the particles, with greater smoothness typically indicating increased maturity. The proportion, median size, and angularity of coarse particles in the surface soil using visual estimation in the field was analysed.

A high organic matter content increases soil aggregate stability and wettability (Chenu, Bissonnais and Arrouays 2000), influencing a soil's fertility and erosion potential. Decomposing organic matter (for example, leaf litter) in soil forms distinctive, dark-coloured humus. To determine organic matter content in the soils of the Kazanlak Valley, the colour of a moistened soil sample was compared to Munsell soil colour charts (Munsell 2000). Since the presence of organic material leads to a darker coloured soil, Munsell values can be used to estimate organic matter content after accounting for soil texture (FAO 2006).

High levels of carbonates increase the water holding capacity of the soil, and therefore water availability for vegetation (Duniway, Herrick and Monger 2010). To assess the carbonate levels, a hydrochloric acid (HCl) solution was added according to USDA procedures (USDA 2014). Three to five drops of 10% HCl solution were added to 2–4 g of soil in a sealable clear sample container. The reaction was observed and qualitatively categorised as no reaction, slight effervescence, or strong effervescence, with these categories indicating increasing carbonate concentration (FAO 2006).

Figure 7.2 Surface soil field sampling.

Figure 7.3 Daily soil analysis at the Kazanlak base.

7.2.3 Geochemistry

To provide data on the geochemical composition of soils across the study area, samples were analysed using an Olympus InnovX Delta 4000 field portable X-ray fluorescence (fpXRF) spectrometer. Analyses were conducted over three days in a controlled laboratory environment, with the fpXRF unit calibrated using silica blanks and NIST standards at regular 20-sample intervals to monitor instrument drift. Samples were analysed twice using both 'soil' and 'mining plus' modes (each mode designed to detect a different set of elements with increased accuracy) through thin-walled plastic bags, with the fpXRF unit held in its stand to reduce shaking (Goodale *et al.* 2012). As the project was primarily interested in the spatial distribution of soil elements, data below the instrumental limits of detection (LOD) were assigned a value corresponding to 50% of the element's detection limit prior to interpolation, according to standard practice (Zissimos *et al.* 2014).

7.2.4 Soil data processing

The collected data were used to assess spatial patterns in soil properties and to develop a quantitative erosion model for the Kazanlak Valley. Coarse fraction (% and mean size in mm), organic matter, carbonate content and geochemistry data were interpolated using the ordinary kriging method and smoothed using a focal/ neighbourhood statistics function, resulting in continuous dataset covering the extent of the study area.

A pedotransfer rule based on Bulgarian soil sample data (Rousseva 2006) was used to derive quantitative clay, silt, and sand content values from qualitative USDA soil texture classifications. As values for each of these three particle sizes are non-independent compositional fractions of the total soil sample, classical interpolation methods such as ordinary kriging are inappropriate and can lead to errors caused by spurious correlations and total sums greater or less than 100% (Pawlowsky-Glahn and Buccianti 2011). An alternative method involving co-kriging of isometric log ratio (ILR) transformed values avoids these issues, and generates improved interpolations of compositional data (Egozcue *et al.* 2003). Accordingly, clay and sand values were transformed to their equivalent ILR components using the *compositions* package (van den Boogaart and Tolosana-Delgado 2008) in R v3.1.2 statistical software (R Core Team, 2014). Co-kriging was then performed on these two ILR components and the resulting rasters back-transformed into the original compositional variables, with silt calculated as (100% – clay [%] – sand [%]). This resulted in interpolated surfaces of clay, sand, and silt compositions (%) across the study area, with summed values bounded correctly to 100%.

To produce a categorical soil texture map, each raster cell within the study area was re-classified into USDA soil texture classes (USDA 1993) using the *soiltexture* R package (Moeys 2014), based on interpolated sand, silt, and clay values. Inclusion modifiers were assigned by classifying interpolated coarse fraction values into regions of 15–35% ('gravelly') and over 35% coarse fraction by soil mass ('very gravelly'). This approach produced a qualitative USDA soil texture map with inclusion modifiers (Fig. 7.8a).

7.2.5 RUSLE and USPED erosion models

The Revised Universal Soil Loss Equation (RUSLE) is an empirically derived model of annual soil loss due to water erosion (Renard *et al.* 1997). Based on the Universal Soil Loss Equation (Wischmeier *et al.* 1978), it can be used to quantify potential rates of erosion (in t ha^{-1} yr^{-1}) under a wide range of climatic, pedological, topographic, vegetation, and management conditions. The model uses six primary factors to determine rates of erosion (Renard *et al.* 1997):

$$E = R * K * LS * C * P$$

E – annual soil loss per unit area; $t\ ha^{-1}\ yr^{-1}$
R – rainfall-runoff erosivity factor; $MJ\ mm\ ha^{-1}\ h^{-1}$
K – soil erodibility factor; $t\ ha\ h\ ha^{-1}\ MJ^{-1}\ mm^{-1}$
LS – slope-length and steepness factors; *unitless*
C – vegetation cover management factor; *unitless*
P – conservation support practice factor; *unitless*

Despite its flexibility, the RUSLE model is limited by its restriction to the analysis of sheet and rill erosion and can misrepresent erosion rates in areas dominated by depositional processes. To address these limitations, the RUSLE was combined with a secondary erosion model: the Unit Stream Power-based Erosion Deposition (USPED) model. USPED is a simple steady-state model that predicts the spatial distribution of erosion and deposition rates based on change in the flow rate of sediments, calculated under the assumption that the amount of sediment carried by water is always at its full transporting capacity, and that this capacity is limited by water flow (Mitasova *et al.* 1996). A key advantage of the USPED approach is that estimating sediment flow at sediment transport capacity relies on the same R, K, C and P factors as RUSLE, with minor modifications to the LS factor (see LS-factor section below). Net erosion and deposition is then calculated from the divergence of sediment flow:

$$ED = \frac{d(T * \cos a)}{dx} + \frac{d(T * \sin a)}{dy}$$

Where:

ED – annual soil erosion or deposition per unit area; $t\ ha^{-1}\ yr^{-1}$

a – aspect of the terrain surface; *degrees*

While USPED has been found to accurately predict the spatial distribution of erosion and deposition (Pistocchi, Cassini and Zani 2002; Zaluski *et al.* 2003), its quantitative

estimates are based on LS-factor parameter values which have yet to be empirically calibrated (Mitasova *et al.* 2013). Rather than relying on these values, USPED outputs were used to conservatively identify broad areas dominated by depositional processes using a >1 $t\ ha^{-1}\ yr^{-1}$ deposition cut-off. These regions were then used to mask parts of the study area where RUSLE modelling may produce misleading erosion estimates.

The following sections describe the derivation of each of the above RUSLE and USPED factors, providing an explanation of the significance of each factor in modelling potential soil erosion and deposition by water. As no specific soil conservation techniques such as contouring, or terracing were present in the valley, the conservation support practice P-factor was excluded from the analysis (as suggested by Renard *et al.* 1997).

7.2.5.1 R-factor: rainfall runoff erosivity

The R-factor represents the erosive power of rainfall. Rainfall erodes soil in two ways: by detaching soil particles with the kinetic energy imparted by a raindrop upon impact, and by runoff from a rainfall event, governed by the volume of precipitation received during a specific period (Wischmeier and Smith 1978). Accordingly, the RUSLE R-factor is defined as the product of the total kinetic energy and the maximum 30-minute intensity of significant rain events, averaged over decades, and expressed in $MJ\ mm\ ha^{-1}\ h^{-1}$ (Renard *et al.* 1997).

A lack of temporal resolution in Bulgarian rainfall data prevented the use of equations proposed by Richardson *et al.* (1983) and Renard *et al.* (1997) to estimate an R-factor for the Kazanlak region. To solve this problem, Rousseva (2006) employed a modified form of Richardson's equations to calculate R-factor values based on annual and long-term data produced by 84 meteorological stations across Bulgaria. The results indicate an R-factor between 1019 and 1033 $MJ\ mm\ ha^{-1}\ h^{-1}$ applies for 74% of the area of Kazanlak municipality (Rousseva *et al.* 2010; Rousseva 2012, pers. comm.). Accordingly, a spatially constant R-factor of 1026 $MJ\ mm\ ha^{-1}\ h^{-1}$ was used for the study area, assuming rainfall is distributed evenly across the (relatively small and uniform) valley floor.

7.2.5.2 K-factor: soil erodibility

The soil erodibility K-factor provides a quantitative indication of a soil's susceptibility to erosion through the detachment of soil particles by falling rain and flowing water (Wischmeier *et al.* 1978; Renard *et al.* 1997). The K-factor is typically estimated using nomographs and derived formulae based on mid-western USA soils, and can produce unreliable results for European soil conditions (Van der Knijff, Jones and Montanarella 2000). Recently, analyses of global K-factor databases have revealed that climate can also greatly affect erodibility, with 'cool climate' soils often associated with K-factor values almost twice those of warmer climates (Salvador Sanchis *et al.* 2008). To account for this dichotomy, the KUERY algorithm provides improved estimates of erodibility based on the local Köppen–Geiger climate classification, the logarithm of the geometric mean and standard deviation particle sizes (D_g and S_g, calculated from soil texture), percent soil organic matter and percent rock fragment content (Borselli *et al.* 2012).

The Kazanlak Valley is located approximately within the Köppen–Geiger Dfb 'humid continental' climate type with cold winters, without a dry season and with cold summers (Peel, Finlayson, and McMahon 2007). Accordingly, we calculated KUERY 'cool climate' K-factor values for each soil sample based on percent soil sand, silt and clay content, organic matter content and coarse fraction (Salvador Sanchis *et al.* 2008), and interpolated the resulting values using ordinary kriging interpolation to provide a continuous surface K-factor map for the study area.

7.2.5.3 LS-factor: slope length and steepness

The slope-length and steepness LS-factor reflects the impact of flow length and topographic slope on soil erosion. For RUSLE, an adapted version of equations by Renard *et al.* (1997) and Wischmeier and Smith (1978) was used to account for flow convergence in the complex terrain of the Kazanlak Valley, while USPED LS-factor was based on Mitasova (1996):

$$\text{RUSLE}: LS = (m+1) + \left[\tfrac{A}{22.13}\right]^m * \left[\tfrac{\sin(b)}{0.0896}\right]^n$$
$$\text{USPED}: \text{LS} = A^n * sin(b)^m$$

Where:

A – the upslope contributing area per unit contour width; *m*

b – the slope angle; *degrees*

m and n – RUSLE and USPED-specific parameters based on flow and soil conditions

22.13 and 0.0896 – standard RUSLE constants (Renard *et al.* 1997)

To calculate LS-factors, we initially pre-processed newly available 30 m resolution Shuttle Radar Topography Mission (SRTM) Digital Elevation Models (DEM) (USGS 2014) to reduce significant grainy noise present across the valley floor. The *r.denoise* module (Stevenson, Sun, and Mitchell 2010) within GRASS GIS 6.4.3 (GRASS Development Team, 2012) reduces noise in a raster dataset while also preserving sharp features associated with complex terrain, greatly increasing the suitability of the resulting DEM for hydrological and landscape modelling.

Slope angle b was calculated using *r.slope.aspect* in GRASS GIS. In order to derive parameter A, downslope flowline density was calculated for each 30 m grid cell within the entire Kazanlak Valley watershed using the *r.flow* GRASS GIS module. This value was multiplied

by the raster resolution (30 m) to estimate upslope contributing area per unit contour width (in m), and restricted to a maximum value of 150 m as per RUSLE recommendations (Renard *et al.* 1997).

For RUSLE modelling, slope values were classified to produce *m* parameter values, which varied by slope (equalling 0.5 for slopes greater than 5%, 0.4 for slopes of 3.5–4.5%, and 0.3 for slopes of less than 3%) (Wischmeier *et al.* 1978). A value of 1.3 was assigned to RUSLE parameter *n* following Diodato, Fagnano and Alberico (2011) and Moore *et al.* (1993). For USPED modelling, we used spatially consistent *m* and *n* values of 1.2 and 1.1 to provide a balance between values suggested for prevailing sheet- or rill-dominated erosion/deposition conditions.

7.2.5.4 C-factor: vegetation cover and management

The vegetation cover and management C-factor accommodates the influence of vegetation and land cover on soil erosion, and is defined as the ratio of soil loss in a specific land cover class compared to corresponding soil loss from tilled, bare soil (Renard *et al.* 1997; Diodato, Fagnano and Alberico 2011). In non-agricultural contexts, the C-factor represents the effect of root, grass, undergrowth, and canopy in stabilising soil and dispersing incoming rainfall, thereby reducing the detachment of soil particles. In agricultural contexts, the C-factor also considers the impact of cropping and land use on soil erosion. In both situations, soil erosion decreases with increased natural or agricultural vegetation cover (Kouli, Soupios and Vallianatos 2008).

Calculating RUSLE C-factor requires field observations and empirical calculations that incorporate prior land use, surface cover, canopy cover, minimum drip height, and surface roughness (Renard *et al.* 1997). As these data were not available for the Kazanlak Valley, C-factor values developed by Panagos *et al.* (2014a) were applied to classify the European Environmental Agency's 1:100,000 Corine Land Cover (CLC) dataset for Bulgaria (EEA 2009). To account for the mixed pastoral and low-intensity agriculture common across the valley, 'pasture' land classes were assigned a modified value of 0.05, while the usually-submerged Koprinka lake-bed assigned a value of 0.5 (consistent with sparsely vegetated land) to allow erosion estimates for areas which may be periodically exposed depending on reservoir water level (Table 7.1).

C-factor values are based on land use observed in November 2011. While little change in vegetation is expected to have occurred since sampling occurred in 2011, changes to the composition and density of natural vegetation caused by natural change and human activity are more likely over the longer term (Bozilova and Tonkov 1990; Connor *et al.* 2013). TRAP research from Straldzha Mire in the Yambol area indicates, however, that regional vegetation, fire, and erosion have been relatively stable

Table 7.1 Vegetation cover and management C-factor values for Corine Land Cover classes*

Code	*Corine Land Cover (CLC) class*	*C-factor*
333	Sparsely vegetated areas (inc. Koprinka lake bed)	0.5
221	Vineyards	0.45
222	Fruit trees and berry plantations	0.35
211	Non-irrigated arable land	0.335
242	Complex cultivation patterns	0.335
243	Principally agriculture, some natural vegetation	0.1
231	Pastures	0.05
324	Transitional woodland scrub	0.01
142	Sport and leisure facilities	0.01
322	Moors and heathlands	0.005
321	Natural grassland	0.005
311	Broad-leaved forest	0.0025
313	Mixed forest	0.002
312	Coniferous forest	0.0015
411	Inland marshes	0.001
121	Industrial or commercial units	0
112	Discontinuous urban fabric	0
332	Bare rocks	0
512	Water bodies	0

**indicating the influence of vegetation and land cover on soil erosion, with higher values indicating greater erosion potential (derived from Panagos* et al. *2014a)*

on the Upper Thracian Plain for approximately the past 3000 years (see Chapter 17 and Connor *et al.* 2013). Given that the Kazanlak Valley is an extension of the Upper Thracian Plain, it can be assumed that similar conditions prevailed here.

7.3 Results

7.3.1 Sediment properties

Soil texture varied greatly across the Kazanlak Valley, with all USDA soil textures except pure 'silt' observed within the study area. Of the 155 sampling sites, over 20% (32 samples) were found to have a 'sandy clay loam' texture (Fig. 7.4).

Results for sand were negatively correlated with clay content, with sandy sediments occurring in higher concentrations towards the north and south of the study area along the mountain foothills (Fig. 7.5c). The highest sand content occurred to the south-east of Koprinka Reservoir, where soils were composed of over 70% sandy sediments.

Soil coarse fraction (solid particles greater than 2 mm in size) followed a similar spatial pattern to sand content, returning the highest values along the mountain foothills. Soil samples from the northern edge of the study area

Table 7.2 Summary statistics for soil properties

Variable	*Type*	*Unit*	*Min.*	*1st Qu.*	*Median*	*Mean*	*3rd Qu.*	*Max.*
Clay content	Soil property	%	7.75	21	28.2	27.4	34.2	45.5
Silt content	Soil property	%	12.9	19.3	25.4	25.9	32.1	43.9
Sand content	Soil property	%	14.6	34.3	45.8	46.7	59.7	78.2
Coarse fraction	Soil property	%	1.28	5.82	9.08	13.1	18.5	47.6
Coarse fraction	Soil property	mm	1.5	4.64	7.48	8.89	11.5	31.5
Organic matter	Soil property	%	1.66	3.04	3.69	3.5	4.05	4.73
Carbonates	Soil property	%	0	0	0.152	1.26	1.46	10.9
LS-factor	RUSLE factor	Unitless	0	0.239	0.437	1.36	1.07	30.4
K-factor	RUSLE factor	$t\ ha\ h\ ha^{-1} MJ^{-1} mm^{-1}$	0.0284	0.037	0.0407	0.0405	0.0443	0.0496
C-factor	RUSLE factor	Unitless	0	0.05	0.335	0.226	0.335	0.5
Erosion	Erosion output	$t\ ha^{-1} yr^{-1}$	0	0.764	2.74	5.91	5.93	388
Erosion	Erosion output	$mm\ yr^{-1}$	0	0.0522	0.189	0.398	0.406	25.6

Revised Universal Soil Loss Equation (RUSLE) factors used for erosion modelling including LS (impact of flow length and topographic slope on soil erosion), K (susceptibility of soil to detachment by falling rain and flowing water), C-factor (influence of vegetation and land cover), and erosion outputs for the study area. Unsampled urban areas and Koprinka Reservoir were excluded from all calculations, while erosion variables also exclude predominantly depositional areas

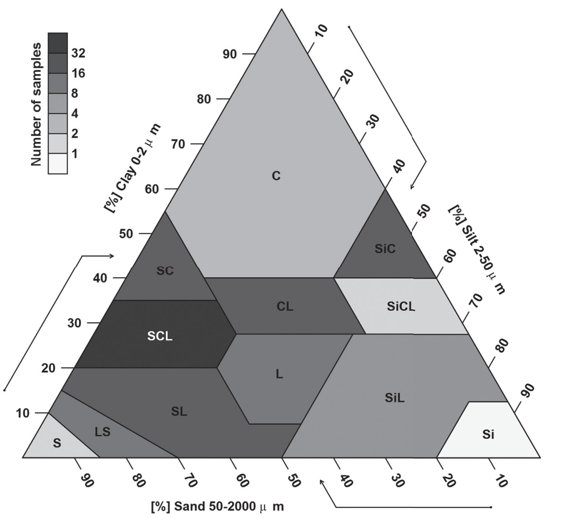

Figure 7.4 Kazanlak soil samples classified by USDA soil texture. Darker colours indicate a higher number of samples with the corresponding texture.

adjacent to the slopes of the Stara Planina exhibited the highest percentage coarse fraction, with up to 47.6% of surface soil consisting of >2 mm rock fragments (Fig. 7.5d). A similar pattern was observed for median coarse fraction size, with the largest rock fragments (31.5 mm) present along the slopes of the Stara Planina. Little spatial variation was found in the angularity of coarse material, with most being angular or sub-angular.

The highest proportions of soil organic matter content were found in the north-western sector of the study area, with a maximum of approximately 5% (Fig. 7.6a). The lowest organic matter content (<2%) occurred on the slopes of the Sredna Gora to the south of the study area. Carbonate concentrations were highly localised, with the highest values (up to approximately 11%) occurring predominantly on mid-slopes (400 to 500 m) of the valley floor to the north and northeast of the Koprinka Reservoir, with negligible values present elsewhere (Fig. 7.6b).

Interpolated maps of sand, silt, and clay composition were combined with soil coarse fraction data to create a qualitative soil texture map with inclusion modifiers (Fig. 7.9a). The resulting map reflects patterns observed for soil properties. Coarse gravelly and sandy sediments occurred most commonly on the slopes of the Sredna Gora to the south of Koprinka Reservoir, and to the north of the valley along the valley floor–Stara Planina transition. Much of the valley floor was characterised by fine silty and clay sediments, which closely followed the arc of the valley from west to east. Loamy soils were present in a small area adjacent to Koprinka Reservoir in the valley's northwest, transitioning into clay loams, which made up the majority of the valley's mid-slopes.

7.3.2 Soil geochemistry

Silicon (mean 3.9%), iron (2.7%), potassium (1.3%), calcium (1.2%), and aluminium (1.1%) were the most common soil elements measured by XRF geochemistry analysis, with undetermined light elements (atomic numbers less than 18) making up the remaining approximately 89% (Table 7.3; Fig. 7.7). A large area bordering the Stara Planina to the north-east of the study area was characterised by soils with the highest iron (up to 7.0%), potassium (2.0%), aluminium (1.6%), titanium (1.5%), phosphorus (0.16%), and barium (0.10%) contents, with elevated levels of trace elements, including zinc,

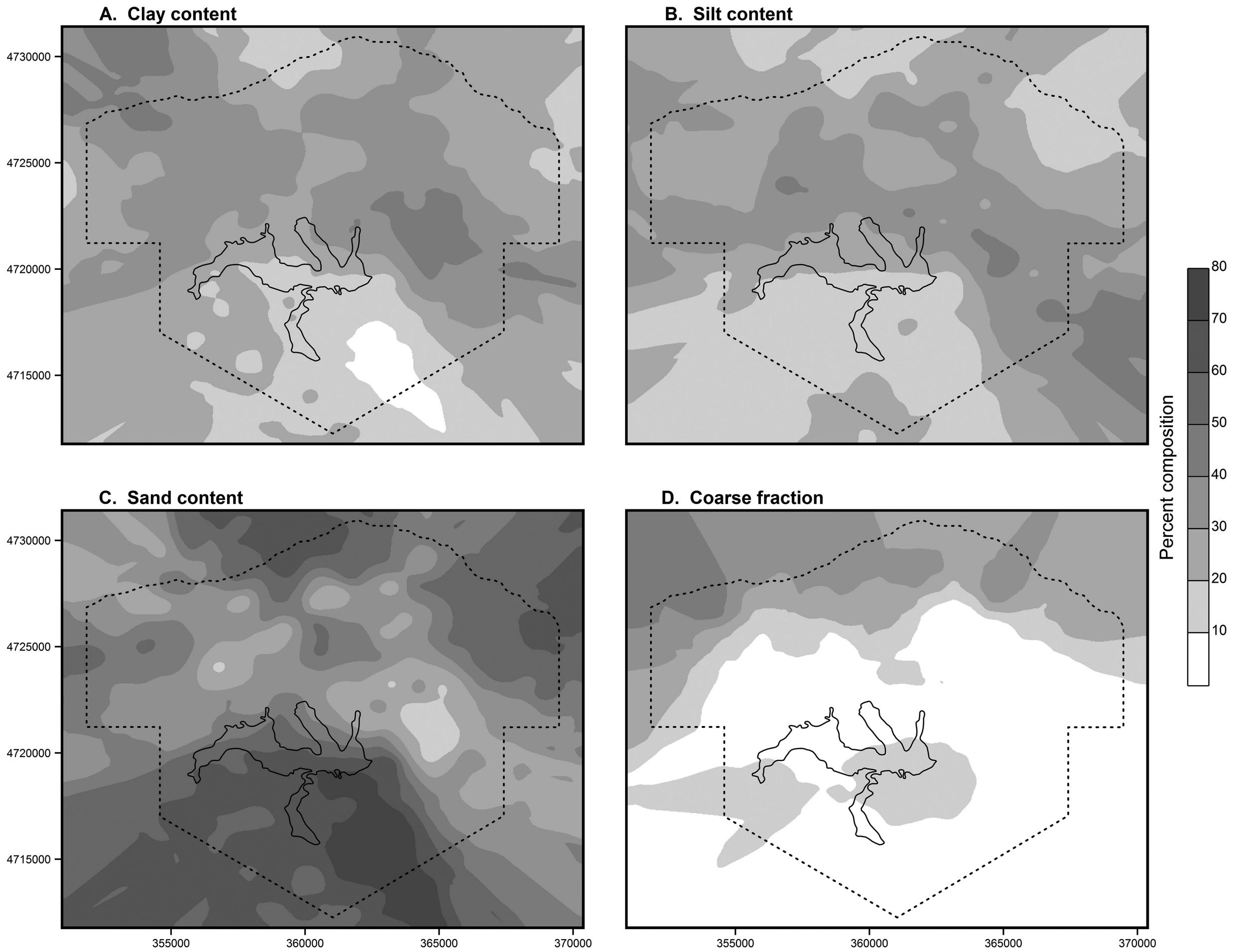

Figure 7.5 Spatial distribution of a) % soil clay content, b) % soil silt content, c) % soil sand content, and d) soil coarse fraction (% of sample consisting of solid particles greater than 2 mm in size) across the Kazanlak Valley study area. Darker shading indicates higher concentrations. Values outside the study area (dashed line) are extrapolations and are not considered reliable.

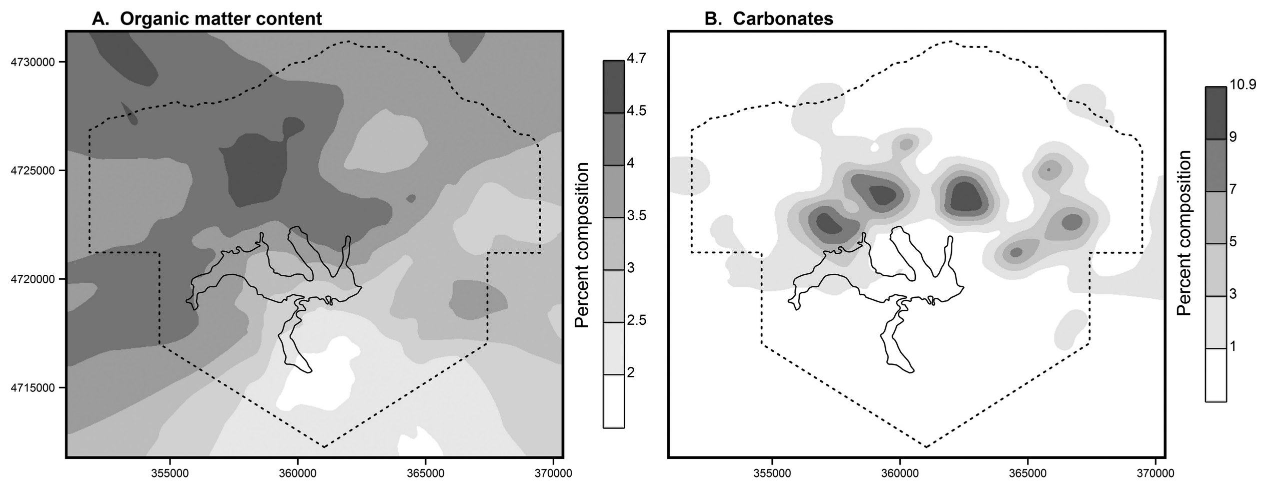

Figure 7.6 Spatial distribution of a) % soil organic matter content and b) soil carbonates across the Kazanlak Valley study area. Darker shading indicates higher concentrations. Values outside the study area (dotted line) are extrapolations and are not considered reliable.

Table 7.3 Summary statistics for soil geochemistry element compositions produced using XRF geochemistry analysis

Element	*Unit*	*Min.*	*1st Qu.*	*Median*	*Mean*	*3rd Qu.*	*Max.*
LE	%	84.5	87.3	88.6	88.4	89.4	91.1
Si	%	1.72	3.34	3.71	3.9	4.36	7.19
Fe	%	0.86	1.65	2.57	2.75	3.61	7.03
K	%	0.6	1.07	1.22	1.28	1.47	2
Ca	%	0.14	0.34	0.54	1.21	1.05	12.52
Al	%	0.46	0.96	1.11	1.11	1.23	1.59
Ti	%	0.13	0.29	0.34	0.42	0.55	1.54
Mn	ppm	170	495	617	614	736	1174
Ba	ppm	163	342	437	463	572	1060
P	ppm	50	285	343	363	419	1609
Sb	ppm	197	270	288	287	305	362
V	ppm	122	227	262	262	299	400
S	ppm	100	165	230	237	292	734
Sn	ppm	135	203	215	217	232	277
Cd	ppm	148	198	210	209	223	254
Zr	ppm	63	147	176	186	210	415
Ag	ppm	124	159	170	170	181	206
Sr	ppm	48	76	89	105	109	307
Ni	ppm	52	86	99	98	109	148
Rb	ppm	27	73	83	87	97	228
Zn	ppm	29	60	86	85	107	175
Cr	ppm	27	55	67	69	82	134
Cl	ppm	30	30	30	66	30	374
Cu	ppm	3	38	50	51	60	295
Ta	ppm	2	29	36	36	44	67
Pb	ppm	13	21	23	25	27	125
Y	ppm	8	20	24	24	27	63
As	ppm	1	5	14	19	31	70
Bi	ppm	5	16	18	18	22	56
W	ppm	10	10	10	17	25	37
Co	ppm	3	9	15	16	22	41
Nb	ppm	4	9	11	14	17	47
Th	ppm	2	7	10	10	13	35
U	ppm	2	2	2	2	2	8
Mo	ppm	2	2	2	2	2	6
Hg	ppm	1	1	1	1	1	8

Values based on raw sample data, and so may differ from interpolated values in Fig. 7.7

arsenic, cobalt, chromium, niobium, yttrium, tantalum, and zirconium (200 ppm or lower).

Low values for many of these elements were recorded across the granitic Sredna Gora to the south, with soils instead being higher in silicon (up to ~7.2%), antimony (362 ppm), strontium (307 ppm), tin (277 ppm), rubidium (228 ppm), and silver (206 ppm), in addition to elevated trace amounts of bismuth and thorium (Fig. 7.7). Across the central valley floor, soils typically contained either moderate levels of all elements, or highly elevated levels of calcium (up to 12.5%) and, to a lesser extent, sulphur (734 ppm) in areas to the north and northeast of the Koprinka Reservoir. Several heavy metal elements including copper and lead varied little spatially, but instead exhibited extremely localised high values (up to 295 and 125 ppm at single sites respectively).

7.3.3 Erosion potential

The combined influence of soil properties on erosivity were incorporated into the K soil erodibility factor (Fig. 7.8a). K-factor values across the study area ranged from moderate to high, with a mean of 0.041 $t\ ha\ h\ ha^{-1}\ MJ^{-1}\ mm^{-1}$ (Fig. 7.8a). Values were greatest (0.05) along the valley floor to the north-east of Koprinka Reservoir.

The RUSLE LS-factor incorporated the effect of both slope and slope length on erosivity (Fig. 7.8b). Values ranged from very low erosion potential along much of the valley floor (<0.5) to extreme values (up to 30.43) along extremely steep slopes of the Stara Planina and, to a lesser extent, the Sredna Gora.

The C-factor reflects the influence of land cover and vegetation on erosion potential (Fig. 7.8c). Values for the Corine Land Cover classes in the study area ranged from a minimum of 0 (a 100% reduction in erosion, indicating non-erosive terrain) to a maximum of 0.5 (signifying half the erosion of tilled, bare soil). Outside of urban areas (assigned a non-erosive value of 0), areas with the lowest erosion potential (<0.05) occurred along the bare rock and heavily vegetated slopes of the Stara Planina and Sredna Gora. Across much of the valley floor, agricultural land use and a lack of vegetative cover resulted in higher erosive potentials (0.05–0.335).

These datasets were combined with the R-factor (1026 $MJ\ mm\ ha^{-1}\ h^{-1}$) according to RUSLE and USPED. At least 8% of the study area was characterised as major depositional areas (Table 7.4), with the most significant areas occurring along the sharp change in gradient at the base of the Stara Planina, along gullies, on the edges of exposed regions of the Sredna Gora, and across the depressed terrain of the Koprinka Reservoir lake bed (Fig. 7.9b). After accounting for these areas, RUSLE predicted erosion rates of between 0 and 388 $t\ ha^{-1}\ yr^{-1}$, with a median rate of 2.74 $t\ ha^{-1}\ yr^{-1}$ (Fig. 7.9b; Table 7.2). Depending on soil density (which ranged from 1.25 to 1.64 g cm^{-3}), median erosion was equivalent to depths of soil loss between 0.17 and 0.22 $mm\ yr^{-1}$.

On the valley floor, typical erosion values ranged between 0.76 and 5.935 $t\ ha^{-1}\ yr^{-1}$, or less than 0.41 $mm\ yr^{-1}$ (Table 7.2). Very high (20 to 50) to extreme (over 50

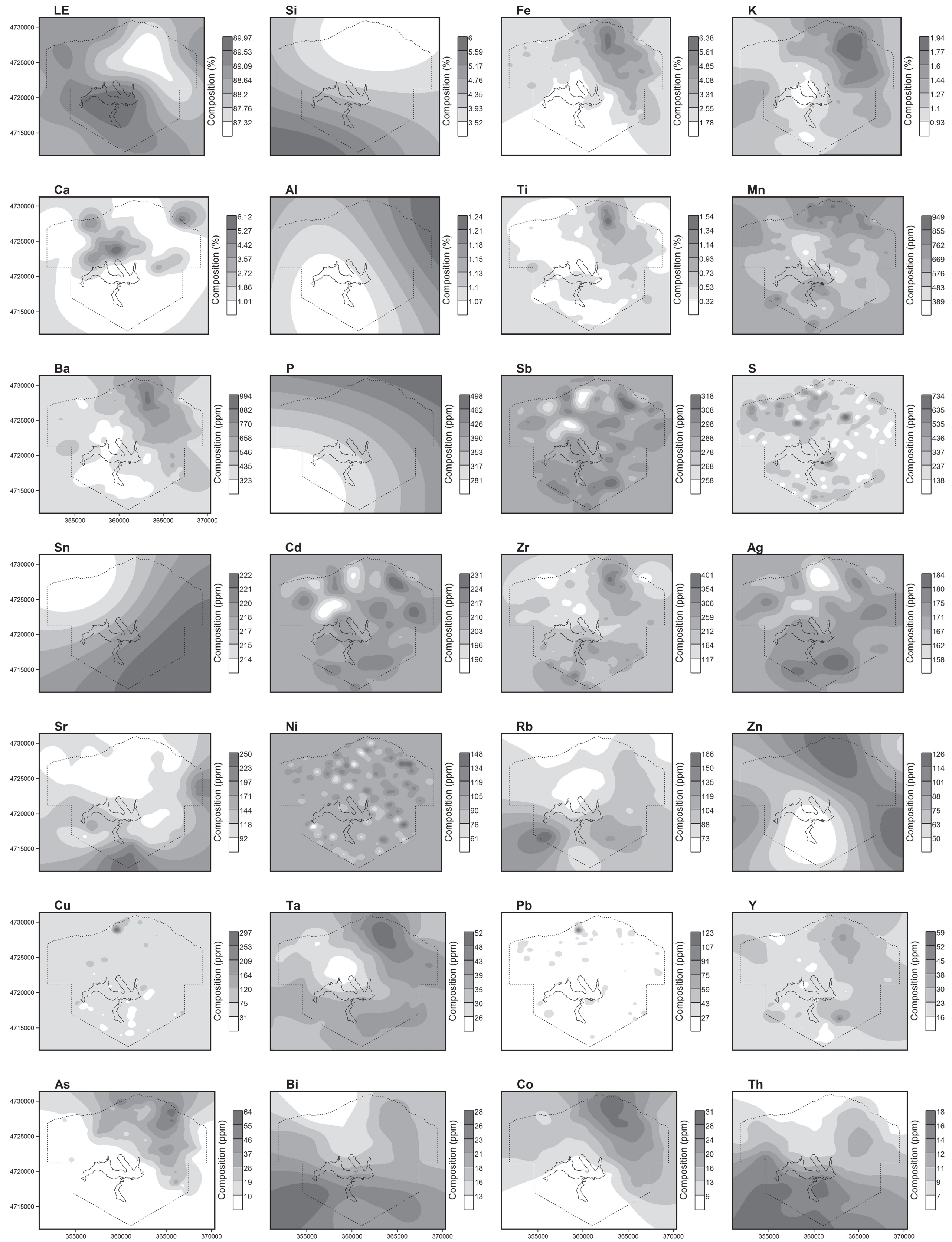

Figure 7.7 Soil geochemistry element compositions across the Kazanlak Valley study area produced using XRF geochemistry analysis. Darker shading indicates higher concentrations. Interpolated values may differ from raw sample data summarised in Table 7.3. Values outside the study area (dashed line) are extrapolations and are not considered reliable. LE = light elements as per text.

Table 7.4 Proportion of study area falling into each potential erosion class

Erosion rate ($t\ ha^{-1}yr^{-1}$)	*Class*	*Area (sq km)*	*%*
n.a.	Major deposition	16.09	8.03
< 0.5	Very low erosion	36.02	17.98
0.5 to 2	Low erosion	43.02	21.48
2 to 5	Moderate erosion	47.51	23.72
5 to 10	Moderate-high erosion	38.32	19.13
10 to 20	High erosion	11.06	5.52
20 to 50	Very high erosion	5.54	2.76
> 50	Extreme erosion	2.75	1.37

classes after Bosco et al. *2015*

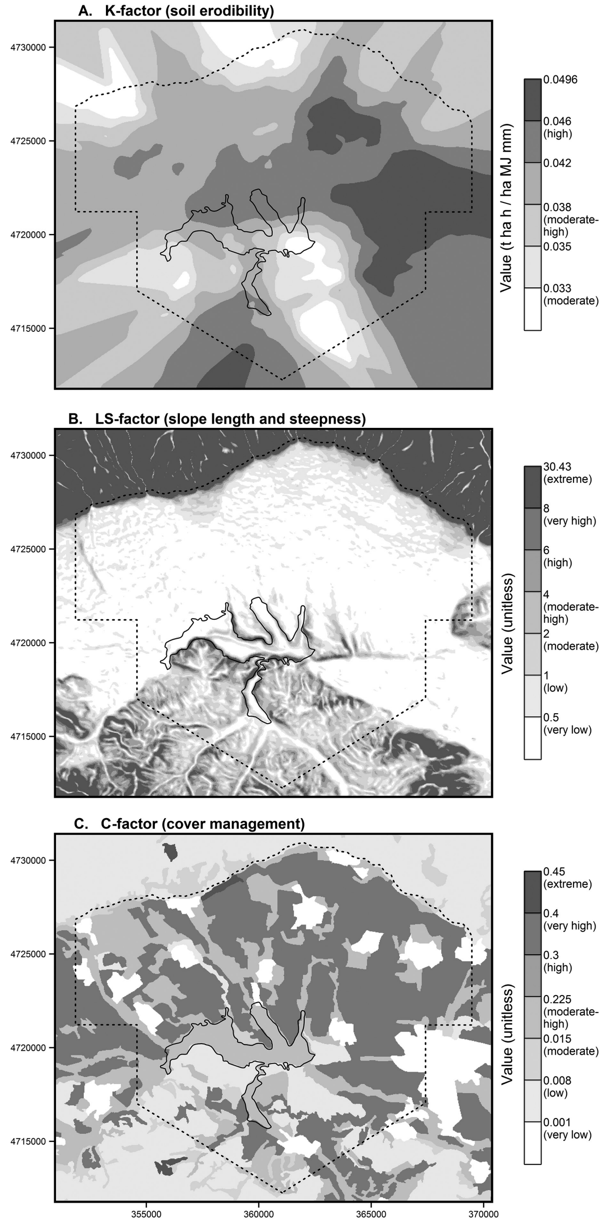

Figure 7.8 Spatial factor datasets used to determine rates of erosion within the Kazanlak Valley study area using the Revised Universal Soil Loss Equation (RUSLE); shading indicates higher erosive potential. RUSLE factors include a) soil erodibility K-factor, b) slope length and steepness LS-factor, and c) vegetation cover and management C-factor. Values outside the study area (dashed line) are extrapolations and are not considered reliable.

$t\ ha^{-1}\ yr^{-1}$) erosion rates were present across approximately 4% of the study area (Table 7.4), including the foot of the Stara Planina, extensive areas of the Sredna Gora, and along the dissected shoreline of Koprinka Reservoir.

7.4 Discussion

7.4.1 Sediment properties

Soils in the Kazanlak Valley were strongly influenced by a combination of geomorphological position, hydrological processes, and land cover. Soils fell predominantly into two broad categories: fine alluvial-drift sediments distributed across the valley floor, and coarse, stony deluvial (colluvial) sediments associated with an abrupt transition in gradient at the foot of the bedrock dominated landscapes of the granitic Sredna Gora and limestone Stara Planina.

Coarse, sandy soils with large and angular coarse fractions were particularly prevalent along the northern edge of the valley, where the Stara Planina range rises abruptly from the valley floor. This finding corresponds closely with the ‘deluvial and deluvial-meadow, sandy and loamy, mainly stony’ soil unit mapped across much of the valley’s north in existing low-resolution (1:400,000 scale) soil mapping (Koynov *et al.* 1968). These soils form either gradually through the processes of downhill soil creep or colluvial slope wash, or rapidly through deposition by rock slides or slumps (Shishkov and Kolev 2014). An opportunistic observation of an eroded profile at the base of the Stara Planina in the northwest part of the study area illustrated this phenomenon: some 6 m of highly angular gravel with minimal soil horizon development was found overlaying a recently excavated archaeological habitation site, suggesting that large mass soil movements along the Stara Planina may be responsible for some of the most rapid and large-scale landscape changes within the Kazanlak Valley.

Elsewhere within the valley, sediments showed strong evidence of hydrological sorting. The gentler slopes of the Sredna Gora to the south of the study area were associated with coarse textured sands and loams, largely consistent with the ‘cinnamonic podzolic’ soils previously mapped in the region (Koynov *et al.* 1968). Water travelling towards the valley floor experiences a drop in energy when reaching the base of the slopes enclosing the valley, first depositing larger, sand sized particles before carrying finer sediments across the remainder of the valley floor. Concentrations of finely textured silts and clays increased greatly with increasing distance from the valley margin, and were deposited in a west-to-east arc across the study area, following the course of the Tundzha River.

Deposition and transportation of sediments through hydrological processes may account for higher carbonate concentrations observed in soils north of the Koprinka Reservoir. Elevated carbonate concentrations first occur at the base of the Stara Planina on the northeast and northwest of the study area, closely matching the location of the geological Iskur Carbonate Group of Triassic limestones and dolomites. From these areas, large channelised streams and braided paleochannels extend southwards across the valley floor, providing a likely mechanism for the weathering, transportation, and subsequent deposition of carbonate-rich Stara Planina sediments across the valley's mid-elevation (400–500 m) alluvial slopes.

Our organic matter results closely match European low-resolution organic topsoil mapping (median of 3.7% compared to 3.5%; Table 7.2) which also modelled elevated organic matter concentrations to the north and northwest of Koprinka Reservoir (Jones *et al.* 2004). Soils in this region resemble 'meadow chernozem-like' soils given their combination of high organic matter, carbonate content and silt-dominated soil texture (Shishkov and Kolev 2014). Such soils are believed to have formed during the Early Holocene (10,000–12,000 cal. BP) in steppe grassland and woodland environments, which have since been cleared for use as orchards or for perennial agriculture. In addition to introducing additional organic material through fertilisation and decomposition of leaf material, the cultivation of broad-leaf fruit trees, perennial lavender and rose oil crops common in this part of the valley are likely to remove existing organic matter from soils more slowly than under heavily tilled annual agriculture (Bot and Benites 2005), highlighting the complex interplay between hydrological processes and past and present land use in shaping soil characteristics within the valley.

7.4.2 Soil geochemistry

Geochemistry results clearly differentiate between sediments associated with the weathering of the Sredna Gora and Stara Planina and provide insights into the origins of soils within the study area. Across the northeastern valley floor, soils exhibited elevated levels of iron and a wide range of other elements associated with metamorphic and igneous lithology. These sediments are likely to derive from the metasediments and volcanics of the north eastern Stara Planina ('Undivided Berkovitsa Group'). These elevated concentrations extended up to 7 km to the south-west from the valley edge, providing an approximate indication of the area influenced by the erosion and deposition of Stara Planina sediments. While the co-occurrence of carbonates with elevated sulphur in some areas potentially reflect the influence of agricultural gypsum (calcium sulphate) application, high calcium content on the valley edge associated with adjacent carbonate geology largely followed HCl-derived soil carbonate estimates and provide additional evidence for the deposition of Stara Planina sediments across large areas of the valley floor.

High silicon, strontium, and thorium content to the south of the study area are consistent with weathering of the granitic geology of the Sredna Gora. These areas are also associated with several economically significant elements, including tin and silver. While copper and lead were also recorded within the study area, their sporadic distribution and association with highly modified sites (including landfills) indicate these are a likely to be a product of modern contamination.

7.4.3 Erosion potential

This study generated one of the highest spatial resolution erosion models (30 m) yet produced for the Kazanlak Valley. Our model predicted median and mean erosion rates of 2.76 and 5.91 $t\ ha^{-1}\ yr^{-1}$ across the study area respectively, with almost 10% of the valley exhibiting high to extreme erosion risk (*i.e.* >10 $t\ ha^{-1}\ yr^{-1}$). These values were moderately higher than coarse scale estimates of mean erosion across Europe (ranging from 1.2 to 2.76 $t\ ha^{-1}\ yr^{-1}$) and Bulgaria (1.9 to 2.2 $t\ ha^{-1}\ yr^{-1}$) (Cerdan *et al.* 2010; Bosco *et al.* 2015). This elevated erosion risk was a factor of both the rugged topography of the valley (evidenced by areas with high LS values of up to 30.4; Table 7.2), and the method used to calculate the soil erodibility K-factor. The K-factor averaged 0.041 $t\ ha\ h\ ha^{-1}\ MJ^{-1}\ mm^{-1}$ within the study area, a value higher than the 0.033 average calculated for the Kazanlak region during previous national erosion modelling (Rousseva and Stefanova 2006; Rousseva 2012 pers. comm.) or the Europe-wide mean of 0.032 (Panagos *et al.* 2014b). This result was an expected outcome of the KUERY algorithm, which compared to previous methods correctly accounts for the higher erodibility of soils in cool climates (Borselli *et al.* 2012). Both median LS and C-factor estimates aligned closely with the range of values reported in previous studies (*e.g.* Panagos *et al.* 2014a) but are likely to have increased accuracy based on the improved resolution of input topographic datasets (*e.g.* 30 m compared to the 90 m used by Cerdan *et al.* 2010).

Soil erosion potential in the Kazanlak Valley was determined by the complex interplay of topographic, soil (physical and chemical), vegetation cover, and land-use properties (Wischmeier and Mannering 1969; Römkens, Roth and Nelson 1977). Although topography was one of the primary controls of erosion across the Kazanlak Valley, its effects were strongly moderated by natural or agricultural vegetation cover. Vegetation can reduce erosion by stabilising soil through the presence of plant roots, reducing the intensity of falling rain, or increasing the stability of soil aggregates through the addition of humus (Amézketa 1999; Chenu, Bissonnais and Arrouays 2000). On the heavily vegetated slopes of

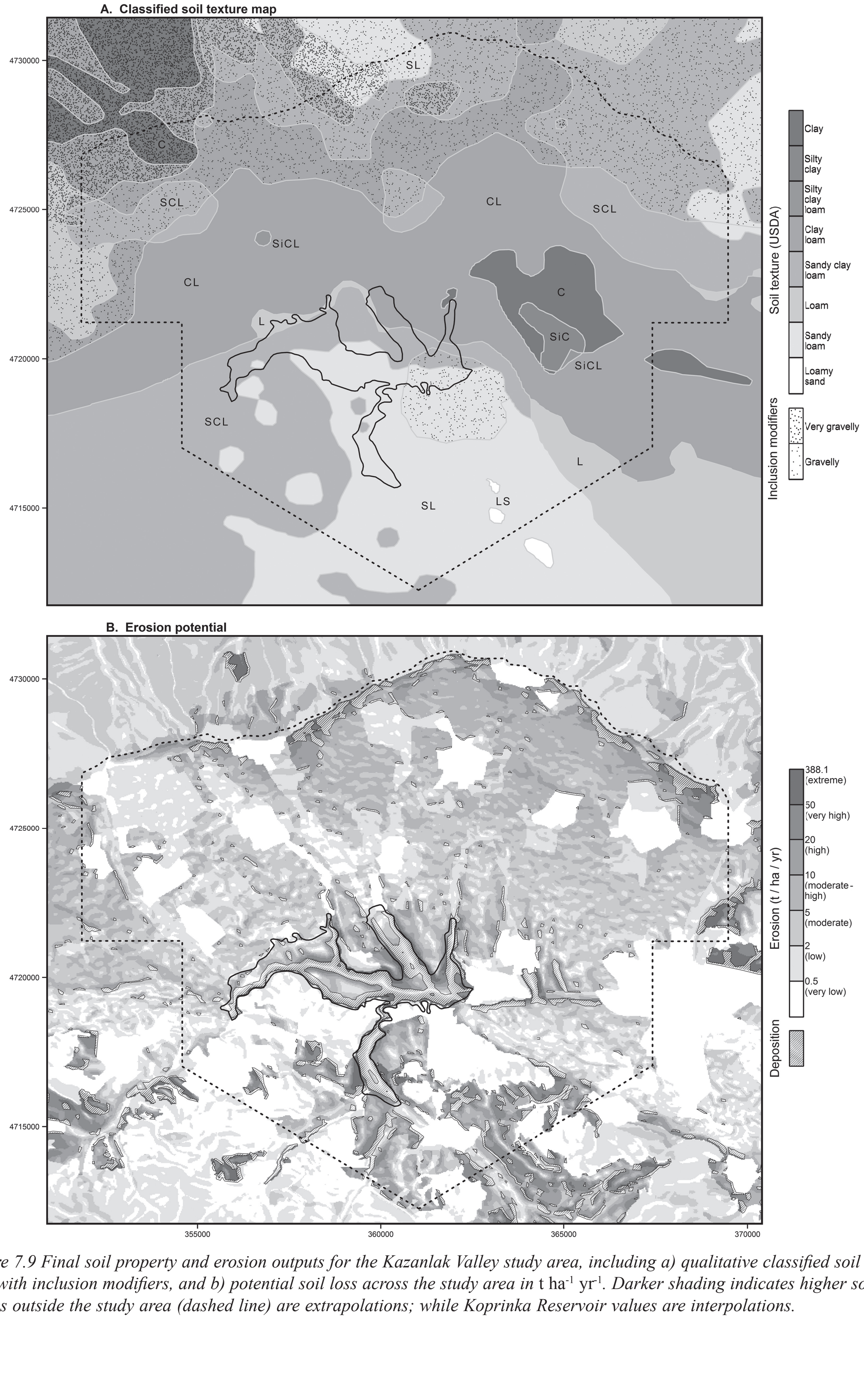

Figure 7.9 Final soil property and erosion outputs for the Kazanlak Valley study area, including a) qualitative classified soil texture map with inclusion modifiers, and b) potential soil loss across the study area in t ha^{-1} yr^{-1}*. Darker shading indicates higher soil loss. Values outside the study area (dashed line) are extrapolations; while Koprinka Reservoir values are interpolations.*

the Stara Planina, these factors combined to reduce soil loss significantly despite the high kinetic energy of water flowing down extremely steep flow paths. At the base of the mountain chain, however, flows entering the valley floor increasingly encountered areas of more disturbed vegetation or agricultural cropland, resulting in a complex matrix of large depositional zones and extreme rates of erosion along much of the Stara Planina-Kazanlak Valley transition (see Fig. 5.5).

While the Sredna Gora south of Koprinka Reservoir are characterised by less extreme topography than the Stara Planina, our model also predicted extensive areas of both high erosion and deposition potential. Erosion potential in the Sredna Gora was highest where agriculture occurred along moderate slopes, with depositional zones found in flat terrain further downslope. Erosion was typically higher in cleared cropland than in land devoted to pasture, as greater grass cover and lack of tillage in these less intensively cultivated areas resulted in lower soil loss. The lowest erosion potential occurred within coniferous forest plantations lining the shore of Koprinka Reservoir, where thick vegetative cover negated the influence of slope and flow length.

Along the base of the Stara Planina and Sredna Gora, coarse sandy soils provided a degree of resistance to erosion. Soils with large particle sizes (*i.e.* sandy soils) decrease the likelihood of detachment by requiring higher energy to move particles, and by increasing the permeability of the sediment to water infiltration (Di Stefano and Ferro 2002). While the presence of rock fragments greater than 2 mm in the surface soil can have both positive and negative effects on erosion, increases in soil loss caused by high subsurface coarse fractions are typically minor compared to the significant protective effect of surface soil rock fragments (Römkens *et al.* 1997). In the Kazanlak Valley, however, soils with a high coarse fraction were largely restricted to areas that also had high topographic relief, and therefore continued to exhibit high erosion potential.

In the less topographically complex valley floor, variation in soil properties played a more significant role in affecting modelled erosion rates. At finer particle sizes, the erodibility of a soil depends on electrostatic and cohesive forces resisting particle detachment. While the presence of clay reduces erosion through increasing cohesiveness between soil particles, larger silt or fine sand sediments provide the least overall resistance to erosion (Di Stefano and Ferro 2002). Within the study area, the highest levels of soil erodibility were associated with silt-dominated soils distributed along alluvial terraces of the Tundzha River.

7.4.4 Archaeological implications and future research

Soil characteristics and the geomorphological setting of the region are likely to have strongly influenced agricultural productivity and the selection of archaeological site locations (Espa *et al.* 2006). Archaeological studies in southern Bulgaria have suggested that soil type was a critical factor influencing the distribution of Neolithic to Bronze Age sites. During these periods, settlements were preferentially located on transitional loam soils where heavy, poorly drained clays grade into less fertile but well-drained sands more amenable to contemporary tilling technology (Dennell and Webley 1975). In addition to newly cleared forest soils and weathered alluvial river deposits, these soils could have supported the productive varieties of einkorn and emmer wheat (*Triticum monococcum* and *T. dicocum*) and hulled and naked barley (*Hordeum vulgare var. vulgare* and *var. nudum*) recorded in similarly aged sites throughout Bulgaria (*e.g.* Popova and Marinova 2004). Stony deluvial soils such as those found across the foothills of the Stara Planina would have supported less productive vine, lavender, and oat crops, or have been restricted to grazing during non-summer months (Dennell and Webley 1975).

The soil data generated by this study provide a valuable quantitative resource for additional archaeological and geoscientific research. Soil characteristics linked to agricultural fertility (*e.g.* soil texture or coarse fraction) could form the basis of potential arable productivity models which relate environmental conditions to agricultural yield (*e.g.* Bishop-Taylor and Sobotkova 2013). These models could be used to assess the reliance of individual sites or archaeological periods on arable or pastoral sources of nutrition, and study the environmental factors influencing or constraining site location throughout the archaeological record. Previous work has also combined arable productivity modelling with site catchment analysis to obtain more informed estimates of pre-modern population densities and environmental carrying capacities (*e.g.* Dennell and Webley 1975; Barton, Ullah and Bergin 2010). The new availability of extensive spatial and temporal datasets produced during TRAP and the KGP provides an ideal opportunity to perform similar studies, which in turn may improve current understanding of how archaeological subsistence and population dynamics interact across time.

KGP erosion modelling may provide valuable insights into the taphonomic factors influencing the abundance and spatial distribution of archaeological sites and artefacts across the study region. Over sufficient time periods, the effect of natural processes such as erosion on archaeological remains may overwhelm the influence of social processes (Barton *et al.* 2002). These effects regularly manifest differentially across the landscape and may encourage misleading archaeological interpretations unless accounted for in analyses. Spatially explicit estimates of erosion and deposition may help resolve some of these issues by providing a quantitative basis from which to evaluate taphonomy. In the Kazanlak Valley, for example, areas with few archaeological finds

but high erosion potential may indicate potential false negative results, while translocation and redeposition from neighbouring or distant sites may be responsible for an abundance of artefacts found within depositional areas.

Analysis undertaken during this project could be extended in a variety of ways. Soil datasets could be improved by coring, which would provide deeper samples and soil profiles, revealing change over time. Identifying paleosols could lead to improved palaeoenvironmental reconstruction, while combining erosion modelling and soil geochemistry data with regional and local palaeoecological research may refine understanding of the ecological factors influencing soil formation over millennia (Nettleton *et al.* 2000). Sample analysis could also be improved by loss-on-ignition testing, which is a more accurate way to determine the organic content of soils than the colour-based estimates used here (Heiri *et al.* 2001). To facilitate reuse or support more detailed future analyses, the complete KGP datasets have been made available online.[1]

7.5 Conclusion

The Kazanlak Geosciences Project generated an exploratory dataset that provides opportunities for future geoarchaeological research. Physical and chemical soil properties were recorded across a 215 sq km study area within the Kazanlak Valley, producing high-resolution soil datasets and maps for the area. Soil properties were combined with topographical and land cover information to produce quantitative estimates of erosion and deposition potential based on RUSLE and USPED modelling. The approach used during this project predicted median erosion of 2.74 $t\ ha^{-1}\ yr^{-1}$ or 0.17–0.22 $mm\ yr^{-1}$, with typical values on the valley floor in the range of 0.76 and 5.935 $t\ ha^{-1}\ yr^{-1}$ (less than 0.41 $mm\ yr^{-1}$). Land use and topography were identified as two of the most important factors controlling soil loss, with areas along the foot of the Stara Planina, the slopes of the Sredna Gora, and shoreline of Koprinka Reservoir showing both the greatest deposition and erosion potential (up to 388 $t\ ha^{-1}\ yr^{-1}$ soil loss). Where topography and land use did not overwhelm other factors, soils with higher concentrations of silt-sized particles, low organic matter, and low coarse fraction were the least stable, showing increased erosion potential.

The outcomes of the KGP demonstrate the utility of collecting archaeologically relevant geoscience data alongside larger archaeological studies. The data generated during the KGP can be rapidly collected across a large study area by a small geoarchaeological team without requiring sophisticated sampling equipment. Laboratory techniques for analysing soil characteristics are reliable and relatively simple, while subsequent GIS analyses can be conducted largely with the aid of freely available open-source software (*i.e.* R, GRASS GIS). Adding such an investigation to an archaeological project is therefore feasible and may provide valuable insights. It contributes to our understanding of how environmental factors influence the preservation and visibility of archaeological features and artefacts, and helps contextualise past patterns of pre-modern habitation across the archaeological record.

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Note

1 Geoscience datasets DOI: https://doi.org/10.6078/M7RN35ZH

8

Kazanlak survey results

Adela Sobotkova and Shawn Ross

Abstract *This chapter presents the results of three seasons of pedestrian surface survey in the Kazanlak study area conducted by the Tundzha Regional Archaeology Project (TRAP), covering an area of just under 86 sq km. Survey strategies were applied adaptively depending on ground visibility, and survey efficiency increased during each season. Archaeological remains included 82 surface artefact concentrations and 773 burial mounds. The sizes of artefact concentrations show the dominance of small, < 1 ha examples. The recovery rate of nearly one artefact concentration per sq km indicates the high survey productivity of the Kazanlak study area, despite the adverse effect of post-depositional processes on the valley floor. Direct comparison of recovery rates with other studies is difficult due to the lack of compatible datasets from other parts of Bulgaria. The density of burial mounds is high compared to parallels in Lydia, and is exceeded only by Bronze Age mound necropoleis of Bahrain and similar in Eurasia. The size profile of the burial mounds in Kazanlak favours mounds less than 1 m high due to a local anomaly, the Gorno Sahrane necropolis, consisting of nearly 400 small mounds. The data also shows that the preservation of mounds is affected not only by mound size, but also surrounding land use, with mounds in pasturelands best preserved.*

Keywords *intensive survey efficiency; burial mounds; surface concentrations; site recovery rates; site definition; Kazanlak; Seuthopolis*

8.1 Introduction

Over the course of three seasons (2009–2011), Tundzha Regional Archaeology Project (TRAP) pedestrian survey teams walked just under 86 sq km in the Kazanlak Valley study area. Some 855 discrete archaeological phenomena were registered, including 82 'surface artefact concentrations' and 773 burial mounds (see Fig. 8.1 and Chapter 3 'Concentrations' section for 'surface concentration' definition).[1] Among the 82 surface concentrations, 60 were newly discovered, 17 were previously known and reconfirmed, while five previously-known legacy sites had disappeared. Eight of the surface concentrations were sampled with total pickups and three concentrations were subjected to trial excavations. Surface material included artefacts from the Chalcolithic, Bronze Age, Early and Late Iron Age, the Roman era, Late Antiquity, and the Mediaeval and Ottoman periods. The chronological designation of surface material remains coarse. Only a few, relatively rare, artefact types, like imported pottery and coins, allowed more precise dating. In addition to burial mounds and surface concentrations, isolated artefacts (*e.g.*, grindstones, stone tools, coins, loom weights, etc.) were inventoried; a well-preserved Bronze Age stone axe and silver coin of Nerva from AD 97 were among the most remarkable isolated finds.

At the interpretive stage after fieldwork, some surface concentrations were merged due to proximity, yielding 72 sites from the 82 concentrations. While the identification and delineation of surface concentrations involved a certain degree of interpretation, the background scatter was generally very sparse, so most concentrations were apparent enough. Definition of sites involved more profound interpretation. It has been useful to retain both categories (concentrations and sites) for comparative analysis. These 72 sites included artefact concentrations unaccompanied by other features (52), standing masonry (11), settlement mounds (2), quarries (2), and legacy sites (5). The digital dataset accompanying this volume includes all primary data about surface densities and artefacts, allowing reinterpretation and reanalysis of concentrations, sites, and isolated finds (see 'Links to Digital Resources' at the beginning of this volume).

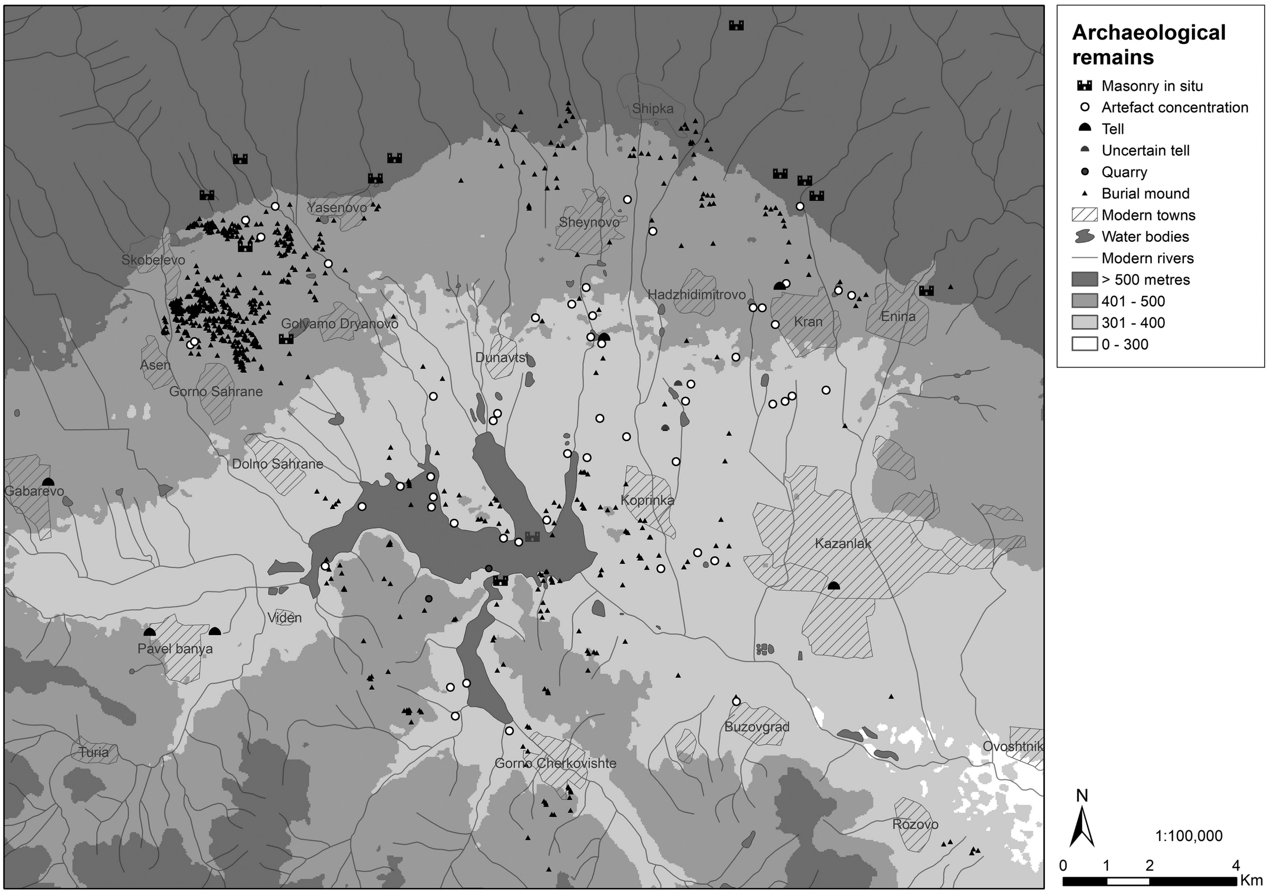


Figure 8.1 Map of all sites and burial mounds in the Kazanlak study area documented during TRAP survey (2009–2011). For survey coverage see colour figures 3 and 4.

This chapter presents survey progress, especially improvements in survey consistency, efficiency, and coverage over the course of three field seasons. A discussion follows of two main categories of sites – surface concentrations and burial mounds – with emphasis on morphological features. The relationship between the setting and morphology is further explored, together with preservation in the Kazanlak dataset of burial mounds. The temporal aspect is moot as most of the mounds documented through survey could not be dated. Finally, the rates of concentration recovery are assessed following Plog, Plog and Wait (1978), Cherry (1983), and Terrenato and Ammerman (1996).

8.2 Survey progress

TRAP conducted pedestrian surface survey in Kazanlak during the spring of 2009, spring of 2010, and autumn of 2011. Despite inclement spring weather, the Kazanlak Valley proved amenable to pedestrian survey of colluvial fans, rose fields, orchards, meadows, and fields flanking the modern villages. Most of the valley was easily accessible, with much of the valley bottom being used for annual agriculture or grazing, thus providing relatively easy passability and good surface visibility.

Having started with five survey teams in the first season, fewer teams were deployed in later seasons due to the challenge of maintaining consistency across the teams. Despite increasing numbers of sites encountered (24 scatters were found in 2009, 39 in 2010, and 21 plus ca. 400 mounds in 2011), survey teams also became more efficient with experience, increasing the number of survey units and the total area surveyed (Table 8.1) . This improved efficiency mitigated the need for more teams.

As problems with digital and paper documentation were overcome, and teams gained more confidence, fieldwalking methodology became more consistent. During each season, vagaries of weather impacted the average number of hours in the field, reducing these to as little as 4.5 per day in 2009 versus 5.1 per day in 2011. On average, it took about 2–3 team-days (10–15 person-days) to survey 1 sq km. For more detailed breakdown of efficiency and coverage by season and team, refer to the TRAP Digital Archive.[2]

8.2.1 Survey coverage

TRAP investigated differences in archaeological residues across ecological zones. To produce a comprehensive picture of past human activity in the Kazanlak Valley, the TRAP survey area included topographical zones

Table 8.1 Overview of survey progress over three campaigns (2009–2011)

Kazanlak season	*Teams*	*Team/days in field*	*Total hours in field*	*Avg hours/ day in field*	*Units*	*ATS Units*	*Area surveyed (ha)*	*Units per team/ day*	*Ha per team/day*
2009	5	75	339.5	4.5	2326	135	3056.7	31	40.8
2010	4	58	277.9	4.8	2734	51	3061.5	47	52.8
2011	4	65	328.5	5.1	2648	15	2472.9	41	38.0
Total		198	945.9	4.8	7708	201	8591.1	40	43.9

Table 8.2 Survey coverage divided by land use

Land use	*Survey Units*	*% of Units*	*Area (sq km)*	*% of Area*	*Average Unit size (ha)*
Annual agriculture	5567	72.2	45.6	53	0.8
Perennial agriculture	443	5.7	5.0	6	1.1
Pasture	1355	17.6	20.2	23.5	1.5
Forest or scrub	343	4.4	15.1	17.5	4.4
Total	7708	99.9	85.9	100.0	1.1

Table 8.3 Kazanlak survey strategy and concentration recovery statistics. Urban survey was used at identified concentrations

Survey strategy	*Survey Units*	*% of Units*	*Area (sq km)*	*% of Area*	*Unit size (ha)*	*Discovered concentrations*	*Concentrations per sq km*
Urban*	210	2.7	0.3	0	0.1	0	NA
Intensive	5420	70.3	37.3	44	0.7	46	1.23
Extensive	1877	24.4	24.9	29	1.3	13	0.52
ATS	201	2.6	23.4	27	11.7	23	0.98
Total/Avg	7708	100.0	85.9	100	1.1	82	0.95

ranging from the banks of the Tundzha River (or Koprinka Reservoir) to the lower Stara Planina and Sredna Gora. The elevation of the area surveyed ranged between 310–1300 masl, with most fieldwork taking place near a mean elevation of ca. 440–450 masl.

Survey also encompassed a variety of modern land uses. Some 45.6 sq km (53%) of the area surveyed was dedicated to annual agriculture, 20 sq km (23.5%) was pasture, 5 sq km (6%) consisted of perennial agriculture, and 15 km (17.5%) was covered by forest, scrub, or other land cover (Table 8.2). Since survey intensity (defined by walker spacing and recording interval, and therefore survey unit size) was driven by surface visibility (colour figure 3), the size of survey units varied with each land use. In Kazanlak, the average size of a survey unit within fields used for annual agriculture was 0.8 ha, and in fields used for perennial agriculture it was 1.1 ha. Survey units in scrub averaged 2.4 ha, and in forest nearly 15 ha. If areas of easy passability and good visibility (mostly agricultural areas) are combined, the relevant survey units averaged 0.9 ha. If all areas of difficult passability and low visibility (forest, scrub, wetlands, and other non-agricultural land) are combined, survey units averaged 4.4 ha. Since the number of walkers per unit did not vary by land cover, the lower intensity itself in difficult, low-visibility areas probably reduced site recovery rates. The trade-off was worthwhile, however, since *potential* recovery rates were already lower due to poor surface visibility (especially for artefact concentrations), while the greater area covered increased the chances of locating sites (see section 8.5.1 ‘Surface concentrations – recovery rates’ below). Surveying a larger area at a lower intensity also allowed the teams to register more burial mounds, as even relatively small mounds were clear to survey teams during extensive survey.

Given the land-use variability within the survey area, intensive survey accounted for 37 sq km (44% of the total area), while extensive survey covered 25 sq km (29%) and adverse terrain survey (ATS) was used across 23 sq km (27% of the total area) (colour figure 4). See the first four columns of Table 8.3 quantifying survey intensity by unit and area.

8.3 Survey biases

Several biases can skew the recovery of surface archaeological remains. Post-depositional processes fundamentally transform the archaeological record since its formation. Observer bias imposes a subjective judgment, filtering the totality of information available on the surface through personal interest or perceived significance. As the observer bias has been discussed

next to the methodology in Chapter 3, this section will focus on post-depositional events contributing to site burial or site loss (Schiffer 1987, 98–9). These post-depositional events include natural processes such as erosion, deposition, and vegetation growth, or cultural processes such as agricultural activity, looting, and urban development (Cherry 1983, 397; van Andel *et al.* 1986, 117–20; Jameson *et al.* 1993, 229; Bintliff 2000, 204).

At the onset of the project, we decided to challenge observer bias and study post-depositional processes in order to give each concentration an equal chance to be discovered (Orton 2000, 8). We did so by (a) conducting a high-intensity survey over a contiguous area, (b) including different environmental and topographic zones, (c) working in different seasons of the year, (d) collecting and recording surface remains regardless of period and quality to ensure representativeness of site types and distributions, and finally by (e) combining surface and subsurface examination where possible. Despite the comprehensive strategy, we did not cover the entire surface of the valley. Areas under the modern settlements are no longer accessible, nor is the bottom of Koprinka Reservoir visible, nor could the ancient surface buried by deposit under the Stara Planina be accessed. In addition, plow zone effects limited the recoverability of surface materials and contributed to site loss (Ammerman 1981; Barker 1984; Bintliff and Snodgrass 1988). A number of surface scatters, described and marked on the map of Domaradzki from his survey of the valley in 1990s, were revisited during TRAP 2009–2011, but little material was detected in these locations (*cf.* legacy surface concentrations 4121 and 4122 in the Kazanlak site catalogue).[3] Excavations also eliminated many archaeological sites, especially burial mounds, from the surface (Kitov 1994; 2005a; 2005b). While it could be expected that visually prominent remains such as burial mounds will get excavated at disproportionately higher rates, other kinds of remains are also no longer extant. There are many sites mentioned in literature, whose surface remains did not match the legacy descriptions, including the Roman villa or vicus at 4116 (Tabakova-Tsanova 1991, 112; Dinchev 1997, 101), the sanctuary of Apollo Zerdenos, 4123 (Tabakova 1959a, 98–116), or the three-nave basilica at 4119 (Tabakova-Tsanova and Ovcharov 1975).

It is a small consolation that with the exclusion of the burial mounds it could be assumed that cultural processes such as urban growth, development, and excavation lead to a systematic loss of surface remains and not a preferred elimination of sites from one chronological period rather than another. Similarly, geological processes while spatially distinct, are patterned and predictable.

Older remains or smaller short-term sites are likely to be buried thanks to the cumulative effect of colluvial and alluvial activity. Colluvium is the erosion of unconsolidated sediment from the mountains and its deposition at the base of hill slopes, through a combination of rain wash, or downslope movement. Alluvium is the accumulation of a deposit of clay, silt, and sand left by a flowing floodwater on an ancient surface. Older remains will also be hard to find in plains, but easier to detect in erosional surfaces (Bintliff and Snodgrass 1988).

Because of site loss and burial, the total number of sites in the Kazanlak Valley is higher than the 82 artefact concentrations and 773 burial mounds inventoried by TRAP. As the natural and cultural processes leading to site loss and burial are predictable (see Chapter 7 this volume), they have been factored into the survey design. The TRAP sample, while incomplete, is representative, and the missing sites are not likely to differ much in kind and distribution from the ones recovered.

8.3.1 Agricultural activity

Deep, mechanised ploughing has occurred in Bulgaria since about 1960. Mechanised ploughs turn soil to a 0.4–0.6 m depth, disrupting and damaging subsoil and its contents. Deep ploughing brings up previously buried remains, and in the process of vertical displacement it destroys their context, churns the remains, and damages their preservation through exposure to water and chemical weathering. Large tractors or deeply ploughed fields were rarely seen during surface survey. Instead, most fields used for annual agriculture were ploughed to a depth of perhaps 0.25–0.4 m and harrowed. As a result, the impact of mechanised ploughing seems to have been smaller in Kazanlak than in Greece or Italy (Ammerman 1985; Alcock *et al.* 1994; Burgers 1998, 57), but harrowing, especially its frequency, can still substantially alter the surface remains. A typical example is the site 2031, which was revisited three weeks after its discovery to conduct geophysical investigations and prepare for excavations. As the site was repeatedly harrowed during this time in preparation for spring planting, the density of surface remains dropped drastically. After three weeks, the original dense concentration had changed beyond recognition and warranted only a 'low-density' label.

The rose oil industry, a legacy of the Ottoman period, has severely affected the Kazanlak landscape in a manner not immediately visible (Fig. 5.6). Rose fields are prepared for planting by a single ploughing to 0.70 m depth, causing tremendous damage to the subsoil. Once planted, the rose fields are productive for decades, and require little intrusive maintenance, only weeding, hoeing, and occasional shallow ploughing between rows. During this productive phase, rose cultivation protects whatever archaeological remains survived the initial ploughing. Afterward, the plants are torn out and the planting cycle repeats, with deeper ploughing if roses are re-planted. More typical shallow ploughing and harrowing follows if the fields are repurposed for annual crops. The rose growing in the Kazanlak Valley takes place especially in the northern part of the valley and is a mixed blessing

Figure 8.2 Marks left by ploughing visible in the eastern profile of trench at 2032 East during trial excavations.

for archaeology in the area. Two pottery scatters were found which contained exceptionally high-quality material (2031 and 2032) thanks to the elimination of rose fields and subsequent new ploughing. Damage from ploughing of this field was documented during test excavation in the eastern sector of at 2032, where plough marks went 0.8 m deep, disrupting the stratigraphy (Fig. 8.2).

8.3.2 Development

Development inevitably transforms landscapes, sometimes destroying archaeological remains or rendering them inaccessible. In Kazanlak, manmade changes have been local and gradual, connected with the expansion of urban areas over decades. Others have been rapid and large-scale, such as the damming of the Tundzha River during the 1950s (Knight and Staneva 1996, 355).

Urban growth (of both cities and villages) contributes to the loss or inaccessibility of archaeological heritage near modern settlements through the burial, transformation, or destruction of pre-modern sites and landscapes. Urban growth has been the cause of many gaps in the Kazanlak survey coverage, most of which coincide with the footprints of modern settlements. In terms of the effects of urban growth, there are many. Current cultural heritage law requires archaeological evaluation and salvage (as required) before every development project. By capturing information about threatened sites, these activities ameliorate the loss of the archaeological heritage somewhat. The settlement mound of Kazanlak, excavated to make way for the construction of a factory (Leshtakov 2005), is a good example of development contributing to the investigation of the past layers of life in the region.

The recent construction of environmentally sustainable energy solutions in the valley and Stara Planina provide a cautionary example of hasty development and its impact on archaeological landscape. In the European autumn of 2011, a part of a registered necropolis was being levelled to clear space for a photovoltaic plant. A number of burial mounds were bulldozed away before the Museum could intervene. A small sample of mounds was back-tracked thanks to GPS records in the now levelled field and associated burials (some fortunately preserved below surface) were subsequently excavated (Nekhrizov, Parvin and Kecheva 2013).

Military activity represents another anthropic factor that has impacted the cultural heritage in Kazanlak. The northwest part of the valley, which contains extensive meadows with stands of trees and clusters of mounds, currently frequented by shepherds with cattle and horse carts, had been, according to local informants, used for military exercises during the Communist era.

Remote sensing analysis of this area, followed by ground control, revealed countless stone features shaped like a doughnut or the letter ‘c’ (colour figure 5). With ground control these features were interpreted as dismantled mounds, reconstructed into military works, or transformed into tank embankments (Sobotkova 2010). The scale of damage is hard to assess as it is not known what the landscape looked like before the military intervention. In the most severely affected area (between Skobelevo and Yasenovo villages) the landscape is so distorted that 70% of features have been marked as suspect mounds.

The construction of the Koprinka Reservoir transformed the southern Kazanlak Valley. The Reservoir inundated 1120 ha of the valley, rendering archaeological remains there inaccessible (Uzunov 1966). The submerged terrain includes river terraces and platforms, which are attractive areas for settlement. In 2011, when water levels were low, it was possible to survey the submerged hillside. Four surface concentrations were found within an 8 m wide strip of newly accessible surface along the northern limits of the Reservoir (see Fig. 8.3). Most notably, the Koprinka Reservoir drowned Seuthopolis, the royal foundation of the Odrysians, which was located on the north bank of the river. Although this substantial (4 ha) city was detected and excavated, it is likely that smaller sites (such as 2198, 2199, and 2019) escaped notice and have been lost. Preparing the Reservoir affected an even larger area. It is hard to estimate the extent of the soil displacement that accompanied construction. Artificial earthworks (stepped levees, mounds, and pits) attest to extensive activities protecting the gradually sloping northern, and especially north-eastern banks of the Reservoir from flooding. After the transformation, lacustrine processes continued to change what had once been valley floor. Due to construction and subsequent processes, much terrain along the northern shoreline of the Reservoir appeared compromised.

In addition to the economic development and growth, illicit activity has also had a major impact on the cultural heritage in Kazanlak. Despite the valley’s high profile, both as the rose attar production centre and as the valley containing the rich tombs of Thracian Kings, it has been popular for looters. Signs of looting were documented by the project teams on almost every standing burial

mound that reached the height of one metre. During the project, gold panners were observed on the banks of the Koprinka Reservoir; in 2009 it was only one man with digging equipment; in 2011 there were several (competing?) groups of men industriously shovelling sand into electrical sieving equipment. Like the project teams, they were happy for the unusually low water table and used it for a detailed examination of the beach sediment. There were also traces of illicit work on flat sites: at 2075, metal detector activity was recorded by the teams. This is illegal in Bulgaria as shallow holes might be dug in search of coins or other metal finds. At 3227, the looters may have been more numerous, and have used a tractor to plough through an overgrown field with collapsed walls to reveal subsurface remains. While the media coverage of every new treasure coming from the Kazanlak tombs had raised public awareness of the cultural heritage, increased local appreciation of it, and consolidated better local collaboration, this positive outcome is a big price to pay for the severe and detrimental impact of looting.

8.3.3 Alluvial, fluvial, and lacustrine processes

Prior to the construction of Koprinka Reservoir, the landscape of the Kazanlak Valley would have been most affected by the fluvial and alluvial processes of the Tundzha River, as its waters eroded and deposited materials along its banks. Regularly, in the aftermath of snow melt or orographic rain, the river would rise from its bed and flood the valley floor and other lowlands downstream. It may have covered the territory with a layer of highly fertile silt, but it also destroyed houses in its path and contributed to turning lowlands into malarial swamps. The reasons behind the construction of the reservoir were both to regulate the river and put in a hydroelectric turbine (Knight and Staneva 1996, 355). In the 30 years after the regulation of the river, the Tundzha River still floods the Thracian Plain south of the mountains, on average 3.3 times a year (Zyapkov 2002, 206, table 3.11).

The water level in the Koprinka Reservoir varies significantly as a function of snowmelt, summer evaporation, and water withdrawal for irrigation. These fluctuations cause increased rates of silting in some places and erosion in others. Silting seems to predominate along the gently sloping north-eastern shore of the Reservoir. Here recent layers of silt often covered the beaches when water levels were low, concealing surface materials (ancient or modern) and hindering access (Fig. 8.3). The few artefacts found on the northern banks of the Reservoir were very worn and fragmented (see entries for 1006, 1015, 5006, and 2019 in the Kazanlak site catalogue).[3]

Erosion occurs along the steep southern banks of the Reservoir and the north-western part of the Reservoir where the former river terraces rise 6–8 m above the river bed in a steep ascent. A number of concentrations in the old river terraces were detected thanks to record low water levels in 2011. Eroded out of the profiles,

Figure 8.3 Survey on 12 November 2011 at the typical water line of the Koprinka Reservoir, showing an 8 m water level drop after a dry summer.

these concentrations (2204, 2205, 2208, and 1015) had a fresh look and their materials were much less worn than their beachside counterparts. The materials originated from a section in the profile, with its lower boundary disappearing in the water. Water movement had washed them downslope, distorting the spatial distribution of surface concentrations and contributing to the mixing of materials from different chronological periods. The processes of erosion and tumbling in the long term contribute to the mechanical wear of artefacts, fragmenting, removing surface treatments, and otherwise wearing the surface materials beyond recognition. The project was lucky to find freshly eroded material and have a comparison with older deposits washed out on the beaches, which were not identifiable with any certainty.

8.3.4 Colluvial erosion and deposition

At the base of the Stara Planina, colluviation is the most powerful post-depositional factor. Weathering of the mountain slopes, supplemented by the fluvial activity of mountain streams, modifies the landscape. Erosion on the steep, upper and middle slopes of the Stara Planina is severe, and is aggravated by tree clearance and grazing, since the scarce vegetation contributes to surface vulnerability. Terraces mitigating erosion were documented only in the Sredna Gora. Deposition of this eroded clastic material occurs on and below the lower, southern slopes of Stara Planina, where it creates large fans extending onto the valley floor. During the excavation of a fourth century BC burial mound in Dolno Izvorovo, in the foothills of Stara Planina northeast of Kazanlak, Nekhrizov and Parvin (2010, 232) noted that the ancient surface at the foot of the mound was buried by a 3.5 m thick deposit of fluvial sediment in some 2,300 years of its existence. The erosional model generated by Bishop-Taylor *et al.* (see Chapter 7) shows that older archaeological layers in the northwest foothills of the Stara Planina can in places be buried under 5 m or more of colluvium.

Colluvial deposition in the northern part of the valley is counteracted by the erosional activity of the

mountain streams. While the streams are seasonal and spatially constrained, the flow rates can be very high for short periods of time. After the spring snow melt, channels are carved through the colluvial deposit revealing archaeological layers buried underneath. This phenomenon was documented at location 3122, where Late Iron Age remains were found embedded in a stream profile at a depth of 2 m. The seasonal stream was 3 m wide, and it carved a 2.5 m deep passage through its gravel bed, demonstrating what rapid and severe erosion such streams can cause. Even where archaeological remains are not present, the profiles of the stream beds offer a window into the geological stratigraphy of the upper part of the valley. If systematically mapped over time (the streams shift location occasionally) the profiles could provide additional clues as to the extent of the 'hidden archaeological landscape' and its recoverability (Bintliff, Howard, and Snodgrass 1999).

8.3.5 Summary of landscape changes

A wide variety of cultural and natural factors have destroyed, transformed, hidden, or revealed archaeological remains and landscapes in the Kazanlak Valley. A study by geoarchaeology students (see Chapter 7) has demonstrated that erosion and deposition continue to impact the recoverability of archaeological residues in the valley. Archaeological materials in Kazanlak erode from steeper slopes, from the walls of channels carved by unconstrained seasonal mountain streams, and the steeper banks of the Tundzha River. Remains get eroded from the steep banks of the Koprinka Reservoir, but become buried by silt on its shallow, gradual banks. Large areas at the foot of the mountains and on the valley floor get buried by colluvial and alluvial deposits (unless counteracted by erosion). The relative dearth of prehistoric material found during the survey confirms the erosional model produced by the geoarchaeology team. Prehistoric materials were scarcely found on the valley bottom, being limited to erosional surfaces. Trial excavations, however, confirmed their presence at several younger-looking sites across the valley.

Although older materials are likely to be buried through the cumulative effects of alluviation and colluviation, they can be exposed by fluvial or lacustrine erosion. This applies particularly to the steep southern banks of the Tundzha River and Koprinka Reservoir, which lie immediately below the Sredna Gora and would otherwise constitute a colluvial zone. Archaeological material may also be exposed by the seasonal streams flowing through the colluvial deposits of the lower Sredna Gora and (especially) the Stara Planina. Such 'windows' into the past are spatially limited; in most depositional zones of the valley, pre-modern remains are likely to be buried.

Archaeologists in the Kazanlak Valley are, therefore, more likely to recover traces of past human activity, particularly artefact scatters, in areas suffering from erosion, development, looting, and other circumstances of change. Such circumstances bring archaeological materials into view – but often damage or destroy them in the process. Annual agriculture with predictable soil turnover, is less likely to produce traces of archaeological evidence than erosion or development. Annual agriculture can, however, yield more materials than perennial agriculture, which sees less soil disruption for long periods of time (aside from shallow ploughing for weed control in some cases). Perennial agriculture, in turn, is somewhat more likely to unearth artefacts than pasture or forest, where the traces of human activity may be buried deep in undisturbed subsoil sealed by vegetation. Areas with significant alluvial or colluvial deposition are the least likely of all to yield archaeological remains.

8.4 Results

8.4.1 Surface artefacts in Kazanlak

TRAP counted 86,251 surface artefacts in the 86 sq km Kazanlak study area. Of these, some 29,844 (35%) were classified as ancient artefacts. Only 1,017 sherds (3% of the ancient fragments and 1% of the total) were diagnostic (only ten of these were within 23 sq km of ATS).[4] In other words, 1 sq km in Kazanlak contained on average just over 1,000 sherds and 12 diagnostics. If we exclude the 23 sq km of ATS area, then 1 sq km of extensive or intensive survey contained on average 1,370 artefacts and 16 diagnostics. Translating this to units, survey units other than ATS featured on average 12 sherds and 0.1 diagnostic fragments. Colour figure 6 shows the distribution of surface remains in the surveyed area in a heat map representing the density of artefacts per hectare.

The quality of the Kazanlak surface material was poor. Most pottery was highly fragmented and severely worn (especially compared to the Yambol study area, see Chapter 14). The reasons for the poor preservation are not well understood; a denser population and greater degree of development (and thus human activities across the landscape), a harsher climate, acidic forest soils, or more aggressive agricultural techniques are all possible causes of an ongoing mechanical and chemical weathering of the surface artefacts.

Several chronological groups were missing or underrepresented in the Kazanlak Valley. As one would expect, the most ancient artefacts (Neolithic through Bronze Age) were scarce, generally limited to the vicinity of known settlement mounds, but Byzantine or Early Mediaeval artefacts were also rare. Even in well-represented eras such as the Late Iron Age or the Roman period, artefacts were often highly fragmented, badly worn, and not very obtrusive. In three instances, concentrations documented by Domaradzki (1991) could not be located, either due to their low density, changed surface conditions, or perhaps the stochastic processes governing the appearance of surface materials (Shott 1995; Ammerman 1985). The problem of disappearing

sites is recognised among survey archaeologists, leading Graeme Barker to comment that archaeological sites can 'come on and off like traffic lights' (1995, 49).

Although, by wider Mediterranean standards, artefact concentrations were distinct, it was sometimes difficult to determine their boundaries when artefact densities transitioned gradually to the background scatter or were obscured by modern materials. Unlike in the Yambol study region, where distinctions between concentrations and background scatter were usually obvious, opinions among the investigators working in Kazanlak sometimes differed. Individual interpretive approaches, based on the varied experience of specialists, sometimes emphasised the quantity of artefacts and sometime the quality (in comparison to the background scatter). These interpretations were also complicated by competing agendas, especially the need to define site boundaries expansively for heritage management purposes, versus more conservatively for settlement analyses where concentrations were used as proxies for pre-modern habitation. Delineating some artefact concentrations provoked disagreement, and some of the isolated finds could, conceivably, be interpreted as surface concentrations (or vice versa). In this context, the decision taken to record and digitally publish the raw unit counts as the primary data, with site boundaries as a derivative, interpretive dataset, is especially important as a mechanism allowing reanalysis and reinterpretation. To further emphasise the problematic nature of sites and their boundaries, the site dataset differentiates between the nuclei and margins and identifies low-density concentrations.

8.4.2 Surface artefact concentrations

In three years of fieldwork in Kazanlak, 82 surface concentrations classified as 72 sites were documented (see Fig. 8.1 and colour figure 6; see Chapter 3 for the definitions of 'surface concentration' and 'site'; 10 of the concentrations were interpreted as multi-centric sites on the basis of spatial proximity or other criteria). These surface concentrations included 52 surface concentrations consisting only of artefacts, 11 instances of standing masonry, two settlement mounds (tells), two stone features in the mountains identified as quarries, and five legacy sites. The standing masonry and tells (but only one of the quarries) were accompanied by surface artefacts as well. Legacy sites include those documented by previous investigations that nevertheless proved difficult to identify in the field during 2009–2011 fieldwork. These five sites included three previously identified Late Iron Age surface artefact concentrations, a Roman vicus, and an excavated Late Antique basilica. Isolated finds were also inventoried, including one coin, one Bronze Age stone axe, four grindstones, and several pre-Mediaeval lithics. These isolated finds are included in the digital dataset, but not used in the analyses below.

Forty-six surface concentrations were discovered through intensive survey (56% of the total, see Table 8.3). Another 13 (16%) were found during extensive survey, at which point teams either reduced spacing or re-surveyed them intensively later (see Chapter 3). Finally, some 23 concentrations (28%) were found during ATS (including during verification of previously known sites), where the rugged terrain precluded intensive re-survey.

Since the background scatter in Kazanlak was fairly sparse, and survey conditions like passability and surface visibility were generally good, artefact concentrations were identified by increased artefact density or markedly higher quality of surface material relative to the surrounding background scatter (i.e., lower fragmentation and less wear, indicating material recently brought to the surface by erosion or agricultural activity). In most cases, the difference between surface concentrations and background scatter was obvious (although delineating a precise concentration boundary was sometimes difficult). In the 72 sites in Kazanlak, 85 spatial nuclei were defined (occasionally multiple nuclei per site were distinguished), and 78 site margins (occasionally neighbouring concentrations were interpreted as a single site; see Chapter 3). For the following analysis, the areas of respective nuclei and margins were summed by site, creating 72 values for nuclei and margins.

The extent of Kazanlak site nuclei ranges from under 0.5 to 10 ha, if we exclude the extreme outlier of Ottoman village of Hamidlu (60.41 ha). Most nuclei fall below 5 ha with the median at *ca* 0.5 ha. Figure 8.4 shows very little spread in the data (the box is very shallow), which is not surprising given that 49 nuclei (68% of the total) are less than 1 ha in extent. These 49 nuclei form the bottom tier of site sizes up to and inclusive of 1 ha. The next 15 nuclei (21%) fall into the 1–5 ha tier, while 6

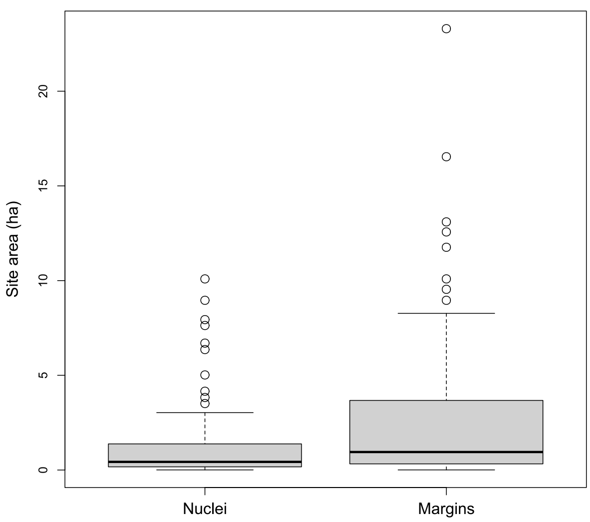


Figure 8.4 Boxplots of Kazanlak site nucleus and margin sizes. The Hamidlu outlier (60.41 ha) has been excluded.

(9%) fall into the 5–10 ha tier. Only two nuclei (2%) are larger than 10 ha.

The area of site margins ranges from under 0.5 ha to about 23 ha (again, excluding Hamidlu). Figure 8.4 shows that the distribution of margins is skewed to the bottom like that of the nuclei, but with a higher median at ca. 1 ha. Despite a similar cluster of values below 5 ha, the height of the box indicates a greater dispersion of margin areas. The smallest tier (up to 1 ha) comprises 37 margins (51%). The 1–5 ha tier includes 28 margins (25%), and the 5–10 ha tier includes 10 (14%). Seven margins (10%) were larger than 10 ha. The shift towards larger sites, especially in the 1–5 ha, 5–10 ha, and >10 ha tiers, apparent in the taller box, extended top whisker, and outliers in Figure 8.4, is an expected outcome of the site boundary spatial definition process.

The boxplots provide a coarse measure of the size range of archaeological residues in Kazanlak and demonstrate that TRAP survey methodology was able to recover sites smaller than 0.5 ha. The period-by-period analysis of site tiers in Chapter 10, however, offers better insights into site hierarchies in specific periods.

8.4.3 Burial mounds in Kazanlak

Burial mounds are the most conspicuous and ubiquitous feature of the Bulgarian cultural landscape. These are earthen constructions ranging in size from <10 m diameter and <0.5 m high, to >50 m diameter and >20 m high (see the variation in Figs. 8.5 and 8.6). Their contents vary from nothing (cenotaphs), to a simple burial with or without an enclosure, to elaborate stone or brick tombs with much architectural and artistic refinement and intrinsically valuable burial goods (Tsetskhladze 1998; Stoyanov 2005; Agre 2016). Thousands of such mounds mark the surface, having been built from the Early Bronze Age through the Middle Ages in the western extensions of the Asian steppes and surrounding areas, including the Kazanlak Valley. The valley is well known for a series of exceptionally rich burial mounds, which gave the region the name of ‘the Valley of the Thracian Kings’. TRAP further discovered that Kazanlak mounds exceed other regions in Bulgaria not only through wealth, but also sheer density, comparing to royal burial complexes in Asia Minor and as far as the Persian Gulf (see section ‘Kazanlak mounds and parallels’ below).

The survey teams registered a total of 773 burial mounds in the Kazanlak survey area.[5] As a distinct category of archaeological remains with high visibility and consistent morphology, the mounds were registered using a specific, standardised form that recorded dimensions, land use, and condition. All but the smallest mounds were prominent enough to be readily identifiable in satellite imagery; remote sensing was consequently used to accelerate burial mound registration and to extend pedestrian survey.

In terms of spatial distribution, the burial mounds in Kazanlak were documented across the entire study area, but were concentrated in three major clusters: the northwest Kazanlak Valley, the Stara Planina foothills, and the former terraces of the Tundzha River that now surround the Koprinka Reservoir (see Fig. 8.7). The northwest cluster was the densest; it included the so called Gorno Sahrane necropolis, which comprised nearly 400 mounds in a 2 × 2 km area bounded by the villages of Gorno Sahrane, Asen, Skobelevo, Yasenovo, and Golyamo Dryanovo. The elevation of mounds varied from 311 to 637 masl, with median at 450 and average value of 442 masl.

When burial mounds are classified by surrounding land use, they occur across all land-use types. Mounds are most frequent, however, in pasture lands. Pastures comprised 23.5% of the surveyed area, but contained 544 mounds (70% of the total). Annual and perennial

Figure 8.5 A medium sized, damaged burial mound in the Kazanlak Valley, looking north towards the Stara Planina.

Figure 8.6 An undisturbed mound of the smallest size rank in the Gorno Sahrane area; looking north towards the Stara Planina.

agricultural fields, which comprised 60% of the area surveyed, contained 133 mounds (18%). Forests and other land uses, which accounted for the final 16.5% of the surveyed area, contained only 96 mounds (12%).

8.4.3.1 Burial mound size and preservation

When sorted by maximum height, the mounds fell into three broad groups: small mounds that were <1 m high, medium mounds 1–5 m high, and large mounds >5 m high (see Fig. 8.7, Tables 14.3–14.4). Using this division, 500 of the 773 registered mounds were small (64.8% of the total sample, see Fig. 8.6), 234 mounds were medium (30.3%, Fig. 8.5), and 38 mounds were large (4.9%).

The mortuary character of medium (1–5 m high) and large (>5 m) mounds has been repeatedly confirmed by over a century of excavation. Many of the medium-sized mounds contained decorated stone chambers or other structures, often robbed but sometimes still containing elaborate grave goods and sacrificed animals (Zhivkova 1975; Krasteva 1992; Venedikov 1998; Kitov 1999; Stoyanova 2005; Valeva 2005; Nekhrizov and Parvin 2011; Nekhrizov 2013; Parvin 2015). Small mounds were more difficult to identify reliably, at least initially. Not all of these small piles of earth and stones had a preserved profile, either because of robber's trenches, erosion, mechanised agricultural activity, or other human or natural processes. In the area enclosed by the villages of Gorno Sahrane, Skobelevo, and Yasenovo, in particular, some the of small, stony mounds appear to have been incorporated into tank emplacements or other defensive earthworks in the course of military exercises (see colour figure 5). Sometimes it was hard to discern if these modern earthworks contained an ancient component. At other times, it was difficult to tell if low mounds of stony earth were burial mounds, or instead products of natural depositional processes (see Fig 7.9a–b in Chapter 7 on the high content of gravel and colluvial deposition in the area), or the result of farmers' efforts to clear their fields of stones. It was only after the rescue excavations of several small mounds during 2012 that doubts about the mortuary character of these small mounds were dispelled (Nekhrizov, Parvin and Kecheva 2013). The excavators found that the small piles of stone on the surface cover inhumation burials, sometimes very badly preserved. The burial goods could be dated to the Early Hellenistic period. It was therefore concluded that most mounds under 1 m high were indeed ancient burials, which happened to be obscured by post-depositional processes and human activity in this part of the valley.

If the distribution of mounds is assessed by land use, taking size into account (see Tables 8.5, 14.3 and 14.4), the majority of mounds are found in pastures (544 of 773, or 70%). Small mounds dominate the pasture group (74%), followed by medium mounds (22%), and finally large mounds (3%). Fields with annual agriculture had a more balanced ratio of mound size groups: 47% small, 42% medium, and 11% large. In the forests, medium mounds were most common (63%), followed by small mounds (29%), and large mounds (8%). Put differently, the largest fraction of mounds of all sizes occurs in pastures (81% of small, 63% of medium, and 52% of large mounds were in pastures).

Some of these size and land-use patterns can be explained through visibility. Forests offer the worst visibility, for example, but represent the smallest land-use unit in TRAP survey and grant protection to the mounds. The forest mound sample is, therefore, skewed towards larger mounds. Indeed, most of the small mounds registered in forest were found in highly cultivated pine plantations on the valley floor, rather than less tended scrub forests on the surrounding slopes. Intensively grazed pastures, by

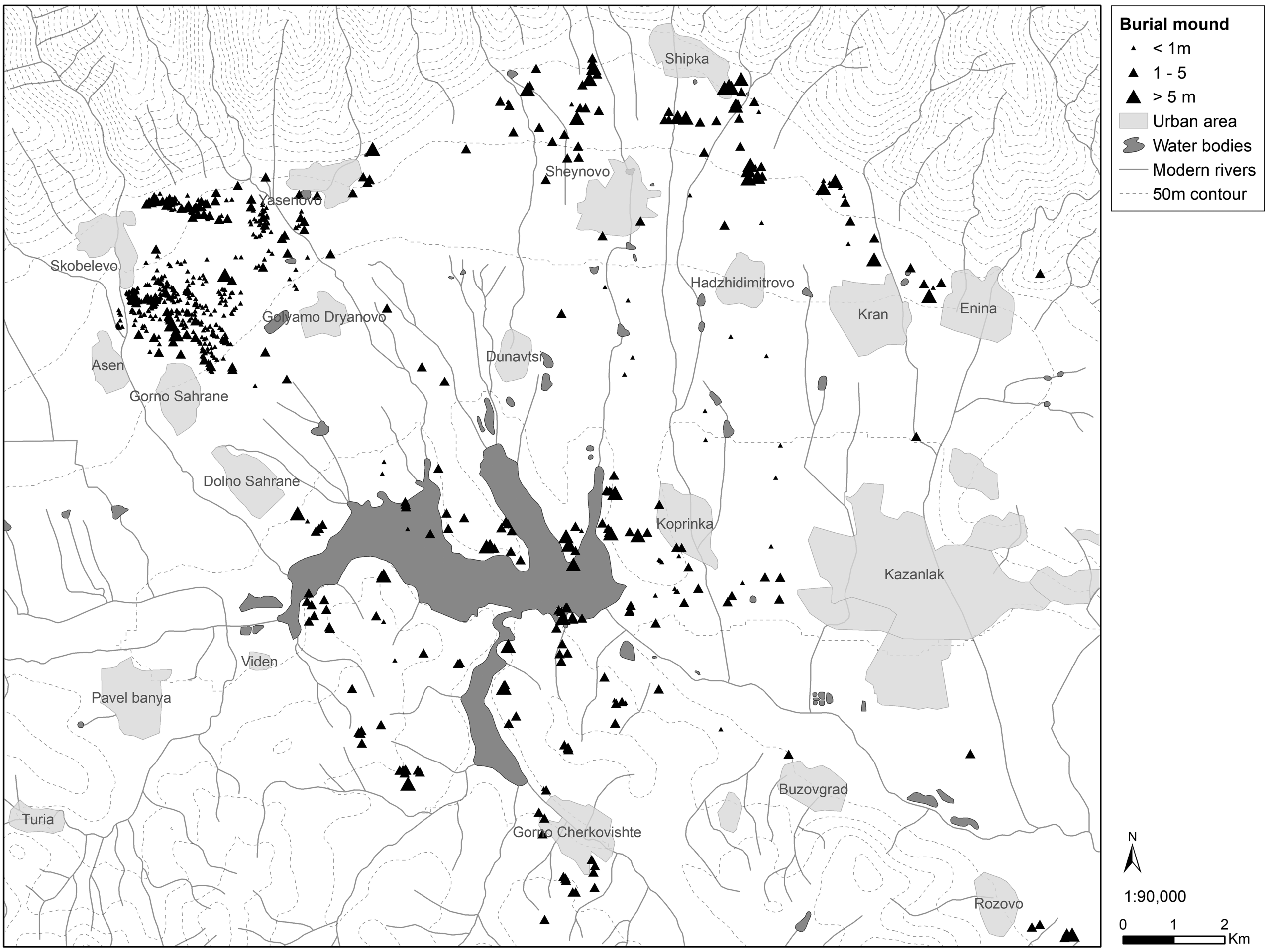


Figure 8.7 Burial mounds within the Kazanlak study area, classified by size. Northwest cluster is referred to as the Gorno Sahrane necropolis.

contrast, offer excellent visibility and allow easy detection of even small earthen features (Fig. 8.6). As an example, the Gorno Sahrane necropolis (with nearly 400, mostly small, mounds), lies in the pastures where even the smallest mounds were readily visible. In areas of non-pasture land use, we were more likely to miss low, unobtrusive mounds, which were often obscured by a combination of vegetation and natural terrain waves. Agricultural activity may also have destroyed relatively small mounds (or at least their exposed profiles). Conversely, farmers may have avoided ploughing areas containing multiple, stony mounds, instead leaving these areas for grazing, again leading to an association between discoverable small mounds and pasture lands (although in this final scenario, the distinction must have remained effective for nearly two millennia to preserve and expose the mounds). Some combination of these factors likely explains our recovery rates and patterns across different land-use zones.

Archaeological residues in Kazanlak are constantly undergoing change, either due to post-depositional processes, agricultural activity, or other anthropogenic factors like looting, development, or military activity. The burial mounds, thanks to their high visibility, offer a unique opportunity for the quantification of human impact on archaeological sites. Their distribution reveals the effects of urbanisation, land use, and terrain on the preservation of archaeological heritage. To calculate these effects and produce a snapshot of mound preservation, the condition of mounds was recorded on a 1-to-5 Likert-style scale: '1' represented the most intact mounds, while '5' indicated that the mound was 'defunct', or essentially destroyed, but with a footprint still visible.[6] This is a coarse measure based on a 'professional judgment about a measurable change in the properties of the mound, related to the archaeological value of the site' (see the discussion of 'effect' in Wildesen 1982, 54). As a result, submeter burial mounds with an intact mantle were labelled '1' or '2', while large mounds whose contents had been looted were marked '4' or '5' due to the destruction of much of the cultural and contextual information. Colour figure 7 shows the distribution of mounds classified by condition, while Table 8.4 links condition to land use. Mounds in agricultural fields suffer the most from degradation through human activity (*e.g.*, looting, ploughing, or even

Table 8.4 Kazanlak burial mounds classified by condition and land use: a comparison of the complete dataset with one excluding the Gorno Sahrane necropolis

LU/ condition	*1– intact*	*2*	*3*	*4*	*5 – extinct*	*Total*	*%*
			Kazanlak with Gorno Sahrane				
Agriculture	5	24	43	40	21	133	17
Pasture	16	336	115	70	7	544	70
Forest	5	46	30	13	2	96	12
Total	26	406	188	123	30	773	100
			Kazanlak excluding Gorno Sahrane				
Agriculture	5	19	33	30	15	102	26
Pasture	14	75	83	30	3	205	53
Forest	5	37	28	7	1	78	20
Total	24	131	144	67	19	385	100

excavation – see the discussion of Kitov's activity in Chapter 6), and some 46% of all mounds within the fields were assigned a condition of 4 or 5, indicating serious damage or near-destruction. Conversely, only 14% of mounds in the pastures were designated a 4 or 5, while 61% were given a 1 or 2 (pristine to good condition). The mounds in the forests lay somewhere in between, with 16% designated 4 or 5, 53% 1 or 2, and 31% 3 (moderate damage). Further analysis indicated that proximity to urban areas may be the most important factor in mound degradation, regardless of land use (Eftimoski *et al.* 2017). Overall, human activity (looting, mechanised agriculture, urban development) represents the greatest threat to the mounds – and likely other archaeological heritage – in the Kazanlak Valley. Indeed, natural processes may be protecting rather than destroying such heritage, judging by the colluvial deposits burying mounds along the northern perimeter of the valley.

Because the Gorno Sahrane necropolis is such an unusual concentration of small mounds, it is worthwhile to analyse the Kazanlak dataset exclusive of this single cluster of sub-metre mounds in order to see the impact on the overall dataset in the valley. If the Gorno Sahrane necropolis is set aside, the mound density drops from 9 to 4.5 mounds per sq km (compare values in the last column of Tables 8.5 and 8.6). Most of the remaining mounds (53%) in Kazanlak still occur most frequently in pasture, although the mound recovery rate in pastures drops from 27 to 10 mounds per sq km (205 in 20.2 sq km). Agricultural fields and forests hold 26% and 20% of the remaining mounds respectively. The recovery rates drop slightly for the agricultural fields, from 2.7 to 2 mounds per sq km (combining perennial and annual). Similarly, in the forests the density of mounds drops from 6.4 to 5.2 mounds per sq km. The biggest change occurs in the ratio of mounds by height; medium size mounds now prevail with 70%, while submeter mounds form 21% of the total. Large mounds increase in proportion from 5% to 9.4%. The new height-group ratios are remarkably similar to the Yambol dataset, which is devoid of a Gorno Sahrane analogue (see Chapter 14, and Table 14.5).

When assessing preservation, without the Gorno Sahrane necropolis the state of mounds shifts across the entire Likert scale. The fraction of intact mounds increases from 3% to 6%, slightly damaged mounds decrease by nearly 20 percentage points from 53% to 34%, damaged mounds (condition = 3) rise from 24% to 37% (see Table 8.4). Both heavily damaged and defunct categories go up by 1 percentage point to 17% and 5% respectively. While each category shifts a bit from the original Kazanlak dataset, the biggest contributing factor to decline is still the location in agricultural fields (75% of mounds in fields fall in category 3–5), which is the same outcome as in the original Kazanlak dataset (Table 8.4). If we consider cumulative ratios of categories 1 and 2 (40%) and 3 through 5 (60%), these match the Yambol dataset (see Table 14.5). All in all, land-use observations of the Kazanlak dataset of mounds stay the same if we exclude the Gorno Sahrane necropolis, while height and preservation statistics shift to resemble the Yambol dataset.

8.5 Survey intensity and site recovery in Kazanlak

8.5.1 Surface concentrations – recovery rates

Forty-six concentrations (56%) in Kazanlak were detected during intensive survey, 13 (16%) during extensive survey, and another 23 (28%) during ATS (see Table 8.3). When the surface concentration (not site) numbers are converted into counts per sq km and classified by strategy, the 37 sq km (43%) of territory with easy passability and good surface visibility subjected to intensive survey had a recovery rate of 1.23 concentrations per sq km. The 48 sq km of territory with easy passability but poor surface visibility where extensive survey was used had a rate of 0.52, and areas of difficult passability and poor surface

Table 8.5 Kazanlak burial mounds (773) classified by land use (including the Gorno Sahrane necropolis)

Land use	*Area (sq km)*	*Mounds*	*% of total*	*Mounds per sq km*
Annual agriculture	45.6	104	13.5	2.3
Perennial agriculture	5.0	29	3.8	5.8
Pasture	20.2	544	70.4	26.9
Forest or scrub	15.1	96	12.4	6.4
Total	85.9	773	100.0	9.0

Table 8.6 Kazanlak burial mounds (385) classified by land use (excluding the Gorno Sahrane necropolis)

Land use	*Area (sq km)*	*Mounds*	*% of total*	*Mounds per sq km*
Annual agriculture	45.6	76	19.7	1.7
Perennial agriculture	5.0	26	6.8	5.2
Pasture	20.2	205	53.2	10.2
Forest or scrub	15.1	78	20.3	5.2
Total	85.9	385	100.0	4.5

Three mounds were eliminated due to small count (two in urban zones and one on the beach)

visibility surveyed using ATS yielded 1.0 concentration per sq km. The concentration recovery rate for intensive survey is over twice that of extensive. The ATS recovery rate is almost as high as intensive, but it is inflated since transects were often guided towards previously known sites, yielding more concentrations than would have been produced by random or stratified sampling.

Consistent with findings in the Mediterranean and elsewhere, the density of concentrations in Kazanlak increases with surface visibility and survey intensity (Plog, Plog and Wait 1978, 389–95, fig. 10.1; Cherry 1983, fig. 1; Terrenato and Ammerman 1996). The relative impact of each factor (surface visibility versus survey strategy) cannot be assessed since the former determined the latter. The significance of their combined effect can be confirmed with a chi-square test run on the number of sites recovered categorised by survey strategy. The null hypothesis would assert that the observed recovery rates are *independent* of survey strategy and surface visibility. Applying the chi-square test to Kazanlak concentrations yields a p-value of 0.019, well below the typical 0.05 p-value denoting statistical significance, indicating that the null hypothesis should be rejected and that site recovery rates are indeed dependent upon the combination of surface visibility and survey strategy.

8.5.2 Burial mounds – recovery rates

When examining site recovery, it is useful to separate between surface concentrations and mounds since the latter are so much more conspicuous. As might be expected, mound recovery rates proved to be independent of surface visibility and survey strategy, unlike surface concentrations. Mound recovery in Kazanlak seemed, instead, driven by land use. While the average density of mounds was 9 mounds per sq km, recovery rates ranged from 2.3 mounds per sq km in fields with annual agriculture, 5.8 per sq km for perennial agriculture, 6.4 per sq km for forests, to 27 per sq km for pasture (Table 8.5). Even eliminating the Gorno Sahrane necropolis, an unusual group of nearly 400 mounds, still yields a recovery rate of 10.2 mounds per sq km in pastureland (Table 8.6). Mound recovery rate in pastures, therefore, is at least 3.5 times that of annual agriculture, 1.4 times the rate of perennial agriculture, and 1.3 times the rate of forests. Notably, recovery rates in forests are higher than in annual agriculture (2.8 times higher) and comparable to perennial agriculture (1.1 times higher), despite obstructive vegetation.

Forests and pastures, which have poor surface visibility, were usually surveyed at a lower intensity (using extensive survey or ATS) than agricultural fields. Nevertheless, these had higher rates of mound recovery. The lack of correlation between increasing survey intensity and increasing recovery rates confirms that survey intensity has a smaller effect on the recovery rate of sites with conspicuous morphology (see, *e.g.*, Wilkinson *et al.* 2004).

8.6 Discussion

The results, notwithstanding their quality, biases, and precision, inevitably raise the question of representativeness. Are the recovery rates and site types in the Kazanlak landscapes typical? This question is hard to answer, especially when it comes to surface artefact concentrations, because TRAP data differs in quality from most Bulgarian survey projects. Assessment of burial mound recovery rates is simpler since burial mounds are conspicuous and readily identifiable.

8.6.1 Kazanlak flat sites and parallels

It is hard to compare the surface concentration recovery rates of TRAP in Kazanlak with other projects in Bulgaria as field methodology and reporting are not consistent, making the results of different projects incommensurate. Other projects often do not monitor or report survey coverage – the area that projects visually inspected – making it hard to translate reported site numbers (however sites are defined) into site densities, and thus compare them with TRAP results. In the Kazanlak study area, TRAP survey recovered 82 concentrations interpreted as 72 flat sites, producing a site density of about 0.8–0.9 sites per sq km. In Yambol the rate is somewhat lower, at 0.7 site per sq km, due to the larger average site size. Site densities from other projects can only be estimated imprecisely, since the total area inspected is rarely reported. Looking at the maps of the Struma Expedition in southwest Bulgaria, site recovery rates seem to approach 1 site per sq km or higher (Grebska-Kulowa and Kulow 2007, fig. 1). The high density of sites may reflect the significance of the Struma Valley as a major north–south trade and settlement corridor, but the estimate remains an interpolation from published maps, rather than a calculation based on reported survey coverage. Elsewhere, the site numbers are small, and coverage cannot even be estimated; seven sites are reported from the hinterland of Pistiros, yet the coverage area is not reported (Gotsev 2007, 111–16).

Given the absence of information about environmental or agricultural conditions in most Bulgarian surveys, comparison of recovery rates by land cover is also limited. Using a comparison of the results of intensively surveyed, high-visibility units on one hand, and extensively surveyed, low-visibility units on the other, the recovery rates of surface concentrations in Kazanlak form a 2:1 ratio. This ratio indicates that the number of surface concentrations in low visibility units could double if vegetation was stripped away and the fields were surveyed at higher intensity. Burial mounds do not exhibit a similar increase in recovery rates with intensity. Instead, their recovery depends upon land use, with more mounds recorded in areas of pasture than forest, and more in forest than agriculture (see Table 8.5). While, the TRAP concludes that varying intensity by surface visibility is only one of many approaches to survey, this approach was chosen to balance the extent of coverage and the rate of site recovery. TRAP covered a larger territory than would have been possible through intensive survey alone, while also registering enough surface concentrations and mounds to allow statistical analyses. The compromise worked given the core aims of the project, which were to develop approaches appropriate to Bulgaria and produce a meaningful settlement and mortuary dataset.

8.6.2 Kazanlak mounds and parallels

Kazanlak mounds have many parallels in other regions of Bulgaria or neighbouring Macedonia, Turkey or Greece in terms of the wealth and architecture of the richest tombs. In Bulgaria alone, the locales of Duvanli, Starosel, Mezzek, Sboryanovo, or Alexandrovo exhibit burial mounds of massive size, with tombs similar in scale and elaboration to those of Kazanlak (even if different in style).

The abundance of mounds in the Kazanlak Valley, however, is exceptional by regional as well as supra-regional standards. The unique nature of the Kazanlak Valley with regard to mound burials has been recognised since early travellers and archaeologists began to visit the region (see Chapter 6). The actual number of mounds, however, greatly exceeds that reported in early gazetteers (most of whom mention a hundred or so mounds). The average density of nine mounds per sq km may be inflated by the gaps in the study area. If the gaps are accounted for by using the larger, 200 sq km remote sensing study area in the Kazanlak Valley, a total of 773 mounds yields a density of 3.8 mounds per sq km. This density is still nearly three times higher than in the Yambol study area, where identical survey and remote sensing strategies produced 1.4 mounds per sq km (see Chapter 14).The legacy data verification campaign in Yambol during 2010 points to a possible inflation in the Yambol survey dataset too. Gathering data from topographical maps, Google Earth imagery, and historical documents, the teams documented some 1600 mounds across the entire province. Only a third of these mounds have been ground truthed so far, but the count represents a density close to 0.5 rather than 1.4 mounds per sq km.

The Kazanlak Valley stands out not only in Bulgaria but more broadly. The region that shows the most affinity on temporal and cultural grounds is Lydia in Turkey. Roosevelt (2006) reports 510 mounds documented during extensive survey in an area of 12,000 sq km. Most of these mounds occur in clusters, the largest of which is at the royal necropolis at Bin Tepe, a locale of some 100 sq km containing some 117 mounds, which date to the Lydian and Persian periods (ca. sixth–fourth century BC). The size and density of these earthworks earned the area the name of the 'thousand mounds', and the author labels it the 'densest *tumulus* cemetery in the region' (Luke and Roosevelt 2016, 410). The mound density in Lydia, even in the Bin Tepe locale, is lower than in the Kazanlak Valley. This difference may be due to the choice of study area boundaries, or the inclusion of only those mounds dating to Lydian and Persian periods in the Luke and Roosevelt study. In Lydia, many mounds can be dated during survey based on tomb architectural styles or a set of criteria including mound shape, visibility, earth colour, and so on (Roosevelt 2006, 69). Conversely, the chronology of mounds in Kazanlak can only be determined by excavation. Excavators in Kazanlak have focused on the largest mounds, most of which were built during the Hellenistic period (Stoyanova and Stoyanov 2016; Nehrizov and Parvin 2010). Several

smaller mounds have also dated to the Hellenistic period (Nehrizov, Parvin and Kecheva 2013). Early Iron Age, Roman, and Mediaeval burials under mounds are, however, also represented (Getov 1965, 203; 1969; Domaradzki 1994a).

Perhaps a better comparison to the Kazanlak mortuary landscape is in the necropolis of Dilmun in Bahrain (Laursen 2008). Here a total of 75,023 Bronze Age mounds have been documented through aerial photography and ground-based survey within the 765 sq km of Bahrain island (Laursen 2008, 157). At nearly 100 mounds per sq km, Dilmun is one of the densest mound groupings in the world. Most of these mounds sit on the local limestone formations and are stratified by size, ring-wall diameter, and distance to nearest neighbour. Mound counts vary from one cemetery to the next, ranging from 650 mounds in Umm Jidr to 11,000 mounds in Aali. Most of these mounds are medium sized (12–20 m in diameter and 1.5–2.0 m high), stone built, and covered by soil. The royal mounds exceed others by an order of magnitude. The Dilmun mounds were all built during a single 400-year span (2200–1800 BC) and are divided into Early and Late Types (2008, 159–60). Laursen argues that these extensive mound fields attest to the presence of elites here as early as the late third millennium BC. The increasing density and elaboration of mounds correlates with historical evidence of rising social complexity in Dilmun, and has been linked to lineages that founded colonies and ruled in surrounding regions of the Gulf and Saudi Arabia (2008, 166). Although the Dilmun example predates Kazanlak considerably, dating to the Bronze rather than the Iron Age, it is a reminder of the complexity and magnitude of funerary production sponsored by lineages who sought to legitimate their rule. The Dilmun necropolis represents 400 years of claims to descent and memory, materialised as burial monuments. Mound density in Dilmun is one order of magnitude higher than in Kazanlak and two orders of magnitude higher than in Bin Tepe. This range underscores the considerable advance in stratification and economic differentiation of the Dilmun society. Similarities among the three datasets, however, recommend comparative study of labour expenditure, mound organisation and stratification, and other aspects of these funerary landscapes as a potentially fruitful avenue for future research.

8.7 Conclusion

Over the course of three field seasons, TRAP surveyed 86 sq km across all major environmental and topographic zones in the Kazanlak Valley study area, producing continuous documentation of surface archaeological material, including the registration of 82 surface artefact concentrations and 773 burial mounds.

The 82 surface concentrations allowed us to quantify concentration recovery rates by surface visibility and survey strategy. As has been found elsewhere, surface concentration recovery rates were highest for areas of good surface visibility subjected to intensive survey (1.2 sites per sq km), and lowest for areas of poor surface visibility subjected to extensive survey (0.5 sites per sq km). The effects of surface visibility and survey strategy on recovery rates could not be disentangled since the former determined the latter. The consistent recovery of small sites (56% of the surface concentrations were smaller than 0.5 ha) demonstrates the sensitivity of intensive survey.

The 773 burial mounds, when plotted by height, produced three morphological groups of small (<1 m high; 65%), medium (1–5 m, 30%) and large (>5 m, 5%) mounds. Recovery rates for these mound height groups depended primarily upon surrounding land use, with pastures producing the highest densities. Pastures and forests also contained the best-preserved mounds. The number and density of burial mounds in the Kazanlak study area matches or exceeds similar mortuary landscapes in the Balkans and Asia Minor, bringing an additional element worthy of inquiry to the 'Valley of the Thracian Kings', although mound groupings elsewhere, as in Bahrain, can be much larger. In addition to the monumental royal tombs, most of which are known through excavation, the valley contains the unique Gorno Sahrane necropolis with nearly 400 small to medium sized mounds in an area of 2 × 2 km, most of which remain unexplored.

The TRAP survey produced a continuous dataset of surface artefacts and features. This has been kept separate from interpretations based on it (concentrations, margins, nuclei, sites, isolated finds, etc.), and is appended in full. This separation facilitates the evaluation of interpretive categories, such as when Dewar's (1991) analysis of contemporaneity is applied to both the broad category of sites and the narrower subset of habitations in Chapter 9. Perhaps more importantly, TRAP data can be reused, reanalysed, and reinterpreted. Sites, for example, can be extracted using different criteria, and their function reassessed.

Notes

1 Kazanlak surface concentrations DOI:https://doi.org/10.6078/M77M0607; Kazanlak sites DOI: https://doi.org/10.6078/M73T9F9D; Kazanlak burial mounds DOI: https://doi.org/10.6078/M7057D0Q

2 Kazanlak survey progress detail DOI: https://doi.org/10.6078/M7VD6WJG

3 Kazanlak site catalogue DOI: https://doi.org/10.6078/M7MW2F76

4 The total yield of diagnostic sherds in Kazanlak is considerably lower (ca. 12 per sq km) than in Yambol (ca. 44 per sq km). This difference is partially the result of

better preservation and higher yield of the Yambol surface concentrations, but also the product of the lower visibility in the Kazanlak study area. The 23 sq km of ATS (27% of total area covered) required by the terrain in Kazanlak, for example, yielded only 10 diagnostic sherds. Excluding the ATS area (201 units and ten sherds), the intensive and extensive survey (7,297 units covering 62 sq km (73% of total area) produced 1,007 diagnostic artefacts. Exclusion of ATS raises the sherd density average to 16.5 diagnostics per sq km, increasing the figure for the Kazanlak study area. ATS survey was not used in Yambol and the ratio of intensive to extensive survey coverage was 70:30. For comparison, Kazanlak ratio of area covered by different survey strategy was 40:30:30 for intensive: extensive: ATS survey (*cf.* Tables 8.3 and 14.2).

5 I am thankful to Dr Barbora Weissová for the streamlining and oversight of the Kazanlak burial mound dataset (DOI: https://doi.org/10.6078/M7057D0Q), which made this analysis possible.

6 Burial mound form DOI: https://doi.org/10.6078/M79S1P33

9

Assessing contemporaneity and uncertainty in the Kazanlak Valley survey datasets

Adela Sobotkova

Abstract *Functional ambiguity and chronological coarseness are well-known limitations of survey data. These issues contribute to the problem of contemporaneity and hinder synchronic settlement analysis. In this chapter, the impact of functional and temporal uncertainty in the Kazanlak dataset produced by the Tundzha Regional Archaeology Project (TRAP) is explored. Four datasets are derived from the Kazanlak surface survey data by excluding uncertainty along two axes, functional and chronological. These datasets are then subjected to Dewar's probabilistic model to estimate the number of contemporary settlements per period. The number of contemporaneously occupied sites in six chronological periods between the Late Bronze Age and Early Byzantine period (1600 BC–AD 1000) are estimated. Dewar's model indicates that occupation span of sites varied over time. Of particular interest is the dominance of short-term sites during the Late Iron Age, pointing to instability in the Kazanlak Valley, later replaced with stability and settlement growth during the Roman period. This assessment further reveals that neither chronological nor functional uncertainty has a significant impact on the analysis of settlement dynamics. The subset of chronologically certain sites produces slightly higher estimates of contemporary settlements and longer estimates of average duration, but the differences remain within one standard deviation.*

Keywords *occupation span; Dewar; contemporaneity; temporal resolution; synchronic analysis; settlement patterns*

9.1 Introduction

A synchronic spatial analysis of settlement patterns (see Chapter 10) requires the consideration of the 'contemporaneity problem' among Kazanlak sites (Schacht 1984; Dewar 1991). Survey archaeologists assign surface concentrations to chronological periods using diagnostic artefacts. These periods often span hundreds of years, with further precision being not feasible, leaving settlement analysis with a dataset of sites that could have been occupied sequentially rather than simultaneously. Bevan and Conolly (2013, 50–5, 224; Bevan *et al.* 2013) have shown how probabilistic assignment of multiple chronological periods to diagnostic artefacts can assist with the assessment of uncertainty and finer spatio-temporal variation in settlement patterns. Likewise, Crema (*et al.* 2010; 2012) used probabilistic methods to assess the bias of and quantify excavated pit house features despite temporal uncertainty. Finally, Demján and Dreslerová (2016) deploy probabilistic methods to overcome both temporal and spatial heterogeneity of legacy data and model past settlement systems. The Tundzha Regional Archaeology Project (TRAP) approach was to assess the contemporaneity of survey sites in relation to their function rather than quantify temporal uncertainty of artefacts or spatial accuracy of archaeological observations.

To assess site contemporaneity, Dewar's (1991) census-based probabilistic method was used and applied to the dataset of sites from Chapter 8 and a subset of 'habitations' derived from it.[1] Contemporary site numbers were estimated as well as the mean occupation span for each chronological period from the Late Bronze Age through the Early Byzantine period.

9.2 Site use span and contemporaneity: the problem with survey data

Survey data has limitations. One of these limitations that has raised scepticism over the reliability of survey data since its broader application to questions of long-term settlement evolution, is the problem of contemporaneity

(Schacht 1984; Dewar 1991). Pollock (2008, 63) summarised the problem concisely:

> What archaeologists recognise as a settlement pattern for a particular period is invariably a palimpsest of successive occupations. Rarely, if ever, were all sites from a single archaeological period actually occupied simultaneously. The longer the duration of an archaeological period and, more importantly, the more frequently people abandoned old settlements and formed new ones, the more severe will be the overcounting of settlements using traditional methods.

This problem results from the fact that surface remains are often worn beyond recognition and that low frequency of diagnostic artefacts leads to the attribution of most survey finds into broad chronological periods. In the case of TRAP work, this coarseness resolves to periods of 300 to 500 years. TRAP site distribution maps, just like most others, are inevitably cumulative. For example, when a village population moves during a single phase, it leaves two sets of remains which get double counted. The problem becomes particularly severe if communities relocate frequently in relation to phase length. While there is a remote possibility that in some periods, mapped sites do overlap (at least temporarily), most if not all site distribution maps are 'overfilled' (Ammerman 1981). Overfilled maps lead to exaggerated population estimates, with no obvious solution to the problem (Weiss 1977). The sequential lifespan of two footprints of a single village can only be verified through the excavation. Few projects have the resources to excavate every site detected. Dewar (1991, 605) pointed out that the lack of contemporaneity of sites in a given period compromises inter-site spatial analysis. Any analysis of site spacing, aggregation, or interaction has at its foundation a distribution of sites, and assumes contemporaneous occupation.

Given that it is not feasible to solve the problem of contemporaneity through fieldwork, the assumption behind diachronic analyses of site distributions was that all sites within a period have identical average occupation spans. In 1991, Dewar used the metaphor of a biologist counting a population of living animals at intervals over time and devised a probabilistic model of estimating the number of 'live' individuals between censuses (1994, 150).

Dewar's model (1991) recognises the fact that even if a site has evidence of use during a given period, it need not have been occupied during the whole of that period. He proposed a simple method to estimate the number of simultaneously occupied sites, providing a more realistic picture of habitation. First, Dewar presumes that there is evidence about site occupation (*e.g.*, diagnostic artefacts) for three periods (X, Y, and Z), and that the aim is to determine the average length of occupation and average number of contemporary sites in the middle period (Y).

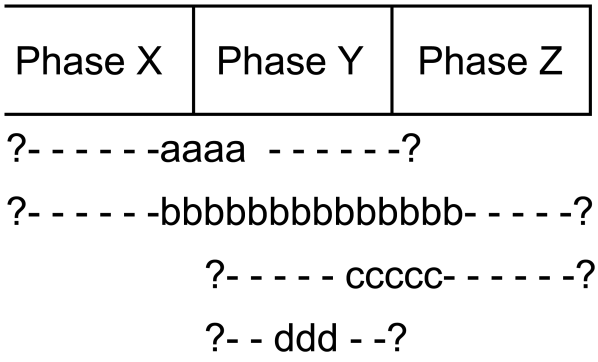


Figure 9.1 Representation of Dewar's site occupation span types. After Dewar 1991.

Dewar then divides all datable sites into four 'occupation span types' (see Fig. 9.1):

a. Sites established during the preceding (X) period and occupied during current (Y) period.
b. Sites established during the preceding (X) period and occupied during current (Y) and succeeding (Z) periods.
c. Sites established and occupied during the current (Y) and succeeding (Z) periods.
d. Sites established and occupied only during the current (Y) period.

Dewar's method assumes that if sites of span type D contain artefacts indicating occupation during period Y, but not preceding period X or successive period Z, then occupation was only for a *portion* of period Y. Sites of type B, however, with evidence of occupation during all three periods (X, Y, and Z), are assumed to have been occupied during the *entire* length of period Y. The two other possible span types (type A occupied during periods X and Y but not Z, and type C during Y and Z but not X), indicate a longer period of occupation than type D (single-period sites) but a shorter occupation than B (three period sites).

Dewar's model after assessing the occupation span types of sites under study derives for each period the rate of site establishment ('Eocc'; the number of sites established in a given period, divided by the length of that period), and the rate of site abandonment ('Aocc'; the number of sites abandoned in a given period, divided by the length of period). From these rates of establishment and abandonment, a Monte Carlo simulation estimates how many sites were occupied simultaneously ('Mean Occ'), assuming that rates of abandonment and establishment were constant during each period. Finally, the method estimates the average duration of occupation during each period ('Mean Use Span') by dividing the abandonment rate by the mean number of contemporary occupations (Mean Occ) and inverting the result. Thus, Dewar's method tells us something about four crucial features of each archaeological period:

1. The average rate of site establishment.
2. The average rate of site abandonment.
3. The average number of simultaneously inhabited sites.
4. The average duration of occupation at those sites.

The method cannot tell us which sites were contemporaneous or the duration of occupation at any given site; it only provides estimated averages (with likely ranges expressed in standard deviations) for the universe of sites in any given period.

So far, despite its promise of handling contemporaneity, Dewar's model has not seen broader application in archaeological analysis or historical narrative. Dewar himself demonstrated the utility of the model on a survey dataset from Mesoamerica. Pollock (2008, 64–5) found the model useful when correcting the settlement data in a heavily archaeological monograph on Ancient Mesopotamia. The one critique and correction to the model (Kintigh 1994; Dewar 1994) provided little advantage over the original model. Given that Dewar's model is readily reproducible from his paper, the reason for its limited use may be the shift in interest from contemporaneity, or the lack of survey datasets large enough to be amenable to the analysis. Given that the historic periods of the Kazanlak dataset fall within the margin of usability in terms of sample size, it was decided to pass it through the model. In addition to estimating the number of contemporary sites, Dewar's model was also used to verify what impact functional and temporal uncertainty of survey data have on the contemporaneity estimates.

9.3 Assessing functional and temporal uncertainty through Dewar's model

Uncertainty, especially chronological, is a well-known phenomenon when it comes to survey materials. All projects are to an extent plagued by unidentifiable artefacts, 'anytime wares', and 'Late Iron Age or Roman period artefacts' (Renfrew and Wagstaff 1976; Bevan *et al.* 2013, 224). Functional uncertainty arises during the functional interpretation of sites. For this interpretation, survey archaeologists rely on the presence or absence of a cross-section of different artefact and material groups on the surface during the time of survey. While the main obstacle here is the non-linear relationship of surface finds to subsurface features, several factors are at play. Low productivity or low differentiation of cultural material during a given period, post-depositional processes favouring high wear and fragmentation of artefacts to decreased archaeological ability to detect and identify this material due to tiredness, low morale, or bad field conditions, all impact on what archaeologists document on the surface (Shennan *et al.* 1985; Carrete *et al.* 1995; Neústupný 1998, 53; Fentress 2004). Survey archaeologists agree that uncertainty exists and while some have explored its causes (Shennan *et al.* 1985), few have explored its impact on the archaeological results.

In this chapter, the survey results are subjected to a two-dimensional study of uncertainty along a functional and chronological axis. Functional uncertainty is expressed using two datasets, one inclusive of all sites and another restricted to habitations. Temporal uncertainty is expressed through the inclusion and exclusion of chronologically uncertain components. First, the site and habitation datasets are compared where temporal uncertainty is included. Later, the site and habitation datasets are compared where the uncertainty has been eliminated. Inside each of these comparisons, there is an additional, functional level of difference, which is represented through the subsample of habitations. Dewar's model was used to explore the impact of functional and temporal uncertainty on the estimates of contemporaneous sites in each of the four resulting datasets from the most inclusive to most exclusive of uncertainty.

Dewar's model expects that all sites will be settlements because its main purpose is to assist with settlement patterns and demographic assessment (see Schacht 1984, 678). The Kazanlak dataset, however, allows analysis to both the broader category of sites and the narrower subset of 'habitations', and examination of whether and how the results differ. Sites are an inclusive category of all surface concentrations or features that mark different forms of human activity, apart from the mortuary features (burial mounds, cemeteries). Habitations include those sites that contained materials indicative of domestic activities (*e.g.*, ceramic assemblages representing a range of functions) and at least semi-permanent occupation (*e.g.*, construction materials; *cf.* Chapter 3), but had no detectable association with mortuary practices. The fact that it may not be possible to reliably separate surface material remains that denote domestic versus mortuary activities is an unavoidable limitation of this division. The application of Dewar's model to both the broader and narrower sets (sites and habitations) helps assess the impact that functional interpretation has on the analysis. Tables 9.1–9.4 summarise the results of applying Dewar's model to the Kazanlak datasets.

The Dewar model in Kazanlak explores six chronological periods spanning from the Late Bronze Age to the Early Byzantine era (ca. 1600 BC–AD 1000). These periods have relatively secure site counts, reasonably well-defined preceding and succeeding periods, and characteristic diagnostic artefacts. The periods can be reliably identified during surface survey given the current state of artefact (especially ceramic) typologies. 'Temporal uncertainty' indicates the existence at a site of ambiguous material that may date to a given period but cannot be identified with certainty, and is denoted by an 'X' or a '?' instead of a diagnostic artefact count in the Kazanlak site table.[1] The first two tables (9.1–9.2) show the results of Dewar's analysis on a dataset including these uncertain periods of occupation at particular sites, while the next two tables (9.3, 9.4) present the results of the same analysis excluding

Table 9.1 Results of Dewar's model in the dataset of Kazanlak Valley sites including 'uncertain' chronological phases

		Occupation span type								
Period	*N*	*a*	*b*	*c*	*d*	*p*	*Eocc*	*Aocc*	*Mean Occ*	*Mean Use Span*
LBA	7	1	1	5	0	500	0.010	0.002	3.74±1.28	1873 (1364–2381)
EIA	22	2	4	10	6	500	0.032	0.016	9.74±2.18	608 (472–745)
LIA	38	8	6	7	17	500	0.048	0.050	13.24±0.43	264 (256–273)
RM	23	7	6	4	6	400	0.025	0.033	11.20±1.04	339 (307–371)
LA	19	5	5	2	7	300	0.030	0.040	8.35±0.94	208 (185–232)
BYZ	15	6	1	3	5	300	0.027	0.037	5.35±0.96	144 (118–170)

Parameters used in the table include: Period – abbreviation of archaeological period (see 'Absolute chronology' on page xiv), N – number of individuals within a period, a – number of sites in use in the preceding and current period (X, Y) but not the following one (Z); b – number of sites used in the preceding, current, and following period (X, Y, Z); c – number of sites used only in the current and following period (Y, Z), but not the preceding one; d – number of sites used only in the current period (Y), but not the preceding or following period; p – length of the archaeological period in years; Eocc – number of sites established per year, Aocc – number of sites abandoned per year; Mean Occ – an estimate of the mean number of simultaneously occupied sites; Mean Use Span – an estimate of mean occupation length at sites during the period in question

them. Thus, the four tables range from the most inclusive (Table 9.1 all sites including those with chronologically uncertain components) to the most restrictive (Table 9.4, only habitations and excluding chronologically uncertain components).

Both pairs of tables list the total number of sites (N), the count of sites that fall into each of the four occupation span types (A–D, as explained above), followed by the estimated rates of settlement establishment and abandonment (Eocc and Aocc respectively), the average number of sites occupied simultaneously (Mean Occ), and the average use span in years (Mean Use Span). The standard deviation attached to Mean Occ estimate is important as it communicates the range of variability for a given estimate. Higher values, such as in the Table 9.1 Late Bronze Age and Early Iron Age estimates (3.74±1.28 and 9.74±2.18 of simultaneously occupied sites), indicate greater variability in site occupation span during these periods.

9.3.1 Estimating contemporaneous sites in the Kazanlak Valley (including uncertain sites)

The broadest dataset to which Dewar's model has been applied contains all sites regardless of functional definition and chronological ambiguity. This dataset includes a total of seven Late Bronze Age settlements. The estimate of contemporaneous sites (3.74±1.28 sites) and the long estimate of mean use span (1873±508 years) are, however, unreliable due to relatively low overall site count and the lack of any Middle Bronze Age sites. The latter is due to exceptionally poor ceramic chronologies for the Bronze Age, particularly the Middle phase (Leshtakov 2009). Late Bronze Age sites may, in fact, reflect a mix of Middle and Late Bronze Age sites, including some that were single-phase in one period or the other. Considering that older material is often underrepresented compared to newer in the surface record (Bintliff 2000, 205), and that ephemeral sites leave less material to begin with, it is also possible that some short-term sites remained undiscovered during survey. The most important purpose for including the Late Bronze Age in this analysis is to provide Dewar's model an identifiable earlier bracket (necessary to define the occupation span type) to the first 'period of interest', the Early Iron Age.

In the Early Iron Age, the number of sites triples (from seven to 22), and so does the estimate of simultaneously occupied sites (from 3.74±1.28 to 9.74±2.18), while the average duration of a site is 608±136 years. The higher standard deviation, however, injects more uncertainty into this estimate. The 44% (as opposed to 53% during Late Bronze Age) ratio of contemporaneous to total sites is likely due to a high number (six of 22, or 27%) of single-phase (span type D) sites, established, occupied, and abandoned entirely during the Early Iron Age. The average occupation span, however, remains as long as the entire period. This long use span of sites is caused by a very low site abandonment rate (half of site establishment rate). The low site abandonment rate results from an observation that many Early Iron Age sites continue to be used during the Late Iron Age (type C sites).

During the Late Iron Age, the site count nearly doubles again (from 22 to 38), but the estimate for simultaneous sites goes up more moderately (from 9.74±2.18 to 13.24±0.43, 25%). Even at the top of one standard deviation range (13.67), only 36% of the 38 identified sites would have been contemporaneous. Again, the low estimate is caused by the large number of single-phase (span type D) sites; during Late Iron Age, single-phase sites comprise 45% of the total (17 of 38). Corresponding to the short-term nature of occupations, the mean use span of sites during Late Iron Age drops to ca. 264±8 years, the shortest span until Late Antiquity. The short life of Seuthopolis (founded in ca. 315 BC and lasting two or three generations, *cf.* Nankov 2008) may not, then, represent an anomaly. Instead, the trend of short occupation span may extend all the way from small, ephemeral surface artefact concentrations to

the regional centre, indicating instability in local settlement across all site tiers.

The total number of sites declines in the Roman period (from 38 to 23), but half of these (11.20±1.04) are contemporaneous. Contemporary sites represent ca. 50% of the total, indicating relatively little flux compared to the Late Iron Age. The mean use span of sites is 339±32 years, covering nearly the entire period (ca. 400 years). The growing use span and high ratio of contemporary to total sites speak of considerable settlement stability during the Roman period.

Some instability reappears in Late Antiquity, where the site number drops to 19 and the contemporary site estimate returns to 8.35±0.94 (44% of total), representing an increase in short-term occupations compared to the Roman period. The mean use span falls by almost half to 208±23 years, signalling a period of less stable settlement. The instability is not surprising, considering the turmoil in the Balkans between the third and sixth century AD.

This pattern becomes even more pronounced in the Early Byzantine period with a further decline in the number of sites (15) and low estimate of contemporary sites (5.35±0.96, or 36% of total). The mean use span reaches a long-term low with average occupation lasting a mere 144±26 years. Notably, 11 of 15 sites are either single-phase (span type D; 5) sites or sites that were occupied in the preceding period and the Early Byzantine period, but not in subsequent periods (span type A; 6). This pattern indicates that instability during the Early Byzantine period ultimately led to a significantly different settlement pattern by its end.

The results produced by Dewar's model shows that raw site count is not always the most realistic figure to use when assessing, for example, changes in population or settlement patterns. Characterising site occupation types, even using chronologically coarse survey data, helps estimate site contemporaneity and separate population movement from population growth. The high site count during both the Early and Late Iron Age results in a great part from cumulative residues of shifting settlement, rather an increasing number of settlements. Greater settlement stability can be observed in the Roman period when, counterintuitively, the total number of known sites declines, but their occupation span increases, yielding a larger number of contemporaneous settlements relative to total count.

Figure 9.2 offers another insight into diachronic differences in settlement. It illustrates the changing patterns of site span types – represented as A–D sequences – through time. Dewar calls the individual histograms the 'fingerprints' of settlement system dynamics (1991, 616). The first notable point is that the A–D sequences differ from one period to the next within the broadest dataset of sites.

Single-phase (type D) sites dominate the Late Iron Age, and are also the most frequent type in Late Antiquity. Type D sites are less prominent in the Early Iron Age,

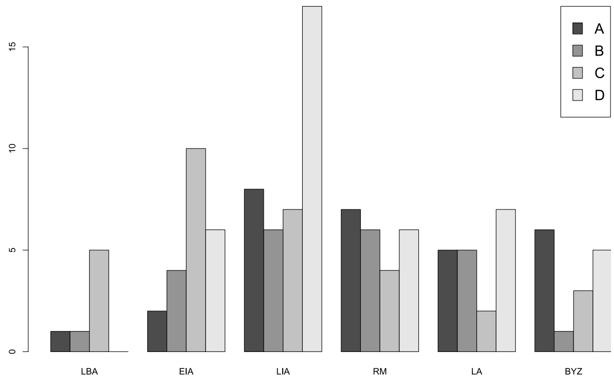


Figure 9.2 Histograms of Dewar's A–D components in the broad site dataset from the Late Bronze Age through Early Byzantine period.

Roman and Early Byzantine periods, absent from Late Bronze Age, thus attesting to problematic site taphonomy and identification in the field. Three-phase (type B) sites, conversely, are most prominent during the Roman and Late Antique period, and least common in the Late Iron Age and Early Byzantine periods. Intermediate, two-phase (types A and C) sites are common across all periods, but are most prominent in the Early Iron Age and Early Byzantine periods. This variation indicates that the ratios of long-lived to short-lived sites and habitations varied over time, and occupation patterns therefore changed from one period to the next. The relative proportions of sites of different occupation spans express the fluidity of the Late Iron Age versus the stability of the Roman period. This result is consistent with conclusions based on Dewar's estimates of contemporaneous sites. The benefit of the histograms is that they provide immediate visual clues about the character of occupation during individual periods.

9.3.2 Estimating contemporaneous habitations in the Kazanlak Valley (including uncertain habitations)

In the second study the original broadest set of sites is restricted to only those sites designated as habitations (based on functional analysis of surface artefact assemblages). Chronologically uncertain components remain included. Using the subset of sites designated as habitations reduces the total number of settlements (N) in all periods except the Late Bronze Age (Table 9.2). Declines are greatest in the Roman period (23 to 17 or 26%) and Late Antiquity (19 to 14, or 26%), followed by the Late Iron Age (38 to 29, or 24%), the Early Byzantine era (15 to 12, or 20%), and the Early Iron Age (22 to 18, or 18%). The total number of sites in the Late Bronze Age remains at seven. This difference is to be expected as total-coverage survey yields non-habitation sites such as production, ritual, or other activity areas.

Table 9.2 Results of Dewar's model in the dataset of habitations including 'uncertain' chronological phases. For legend see Table 9.1

		Occupation span type								
Period	*N*	*a*	*b*	*c*	*d*	*p*	*Eocc*	*Aocc*	*Mean Occ*	*Mean Use Span*
LBA	7	1	1	5	0	500	0.010	0.002	3.75±1.00	1873 (1364–2381)
EIA	18	2	4	7	5	500	0.024	0.014	8.26±1.30	590 (496–683)
LIA	29	7	4	7	11	500	0.036	0.036	10.74±0.14	298 (294–302)
RM	17	6	5	2	4	400	0.015	0.025	8.78±1.25	350 (300–400)
LA	14	3	4	2	5	300	0.023	0.027	6.22±0.44	231 (215–247)
BYZ	12	5	1	3	3	300	0.020	0.027	4.78±0.70	177 (151–203)

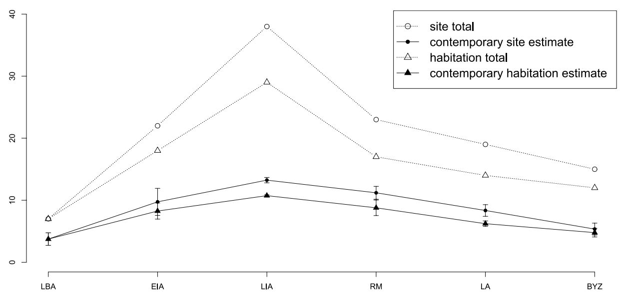


Figure 9.3 Count of identified versus estimates of contemporary sites and habitations in Kazanlak (broadest datasets including 'uncertain' components), from Late Bronze Age to the Byzantine period. Error bar represents one standard deviation.

Dewar's estimates of contemporaneous habitations (Mean Occ) tend to decline given the more restrictive dataset, although less dramatically than in the broadest site dataset, while mean use span tends to increase (see Table 9.2; Figs. 9.3 and 9.4). Solid lines with standard deviations in Figure 9.3 illustrate the differences in contemporary estimates between the two datasets. The Early Iron Age loses about one site (from 9.74±2.18 to 8.26±1.30 or 15%), while mean use span remains essentially unchanged (608 vs. 590 years). The Late Iron Age loses three sites (13.24±0.43 vs. 10.74±0.14 or 20%), while its mean use span rises (from 264 to 298 years). The Roman period also loses two to three sites (from 11.20±0.43 to 8.78±1.25 or 22%), while mean use span rises (from 339 to 350±50 years). In the Early Byzantine era, the number of contemporaneous settlements drops by two (from 8.35±0.94 to 6.22±0.44 or 26%), as does mean use span (from 208±23 to 231±16). Overall, in the functionally restricted dataset of habitations, short-term (one or two phase) sites decline and standard deviation drops. The ratio of contemporaneous to total counts in habitations is higher than in the site dataset, and mean use spans increase, signalling more settlement stability. In most periods, the difference in the estimated contemporaries and mean use spans between the site and habitation dataset is small (within one standard deviation). Only in the Late Iron Age and Late Antique period is the difference between the estimated averages greater than their standard deviations. The biggest impact is the general reduction in both total habitation counts (18–26%) and contemporaneous habitations (15–26%), again reflecting the elimination of predominantly short-term sites as the site dataset was restricted to habitations.

Functional uncertainty (difference between broadly interpreted sites and restricted-to-habitations dataset) seems to have little impact when correcting our dataset for contemporaneity with Dewar's model. Survey projects using similar field methods and employing similar site definitions as TRAP (see Chapter 3) need not worry about strict separation of habitations from the general pool of non-mortuary sites. While the restricted dataset differs slightly when it comes to the number of contemporaneous sites and shows narrower ranges of standard deviations and longer time spans, the difference is not immense. As having a sufficiently large dataset to run the analysis may be a greater challenge, running Dewar's model on a combined dataset is worth the try.

9.3.3 Estimating contemporaneous sites in the Kazanlak Valley (excluding uncertain sites)

The exclusion of chronologically uncertain components from the broadest dataset of sites reduces the total counts in Table 9.3 by some 5–20% depending on period. Compared to original dataset, the Late Bronze Age shows a reduction of site count by one uncertain site, which decreases the mean number of simultaneously occupied sites from 3.75±1.00 to 2.70±0.98 and drops site longevity to the mean of 1,353±491 years. Again, these numbers are not very reliable given the small sample size of six. In the Early Iron Age the reduction of site count by three uncertain sites (14%) leads to a decrease in contemporary sites by two (from 9.74±2.18 to 7.76±1.6, 20%) and the reduction of use span from 608 to 485±100 years. Contemporary sites now form 41% of total, after 45% during the Late Bronze Age. During the Late Iron Age, site count drops from 38 to 34 (10%) in the chronologically restricted dataset and the estimate of simultaneously occupied sites drops from 13.24±0.43 to 11.24±0.13 (15%), marking a maximum among the observed periods. The new estimate is lower by only two sites, but falls outside the narrow standard deviation of the former estimate 'inclusive of temporal uncertainty'. The new 0.13 standard deviation

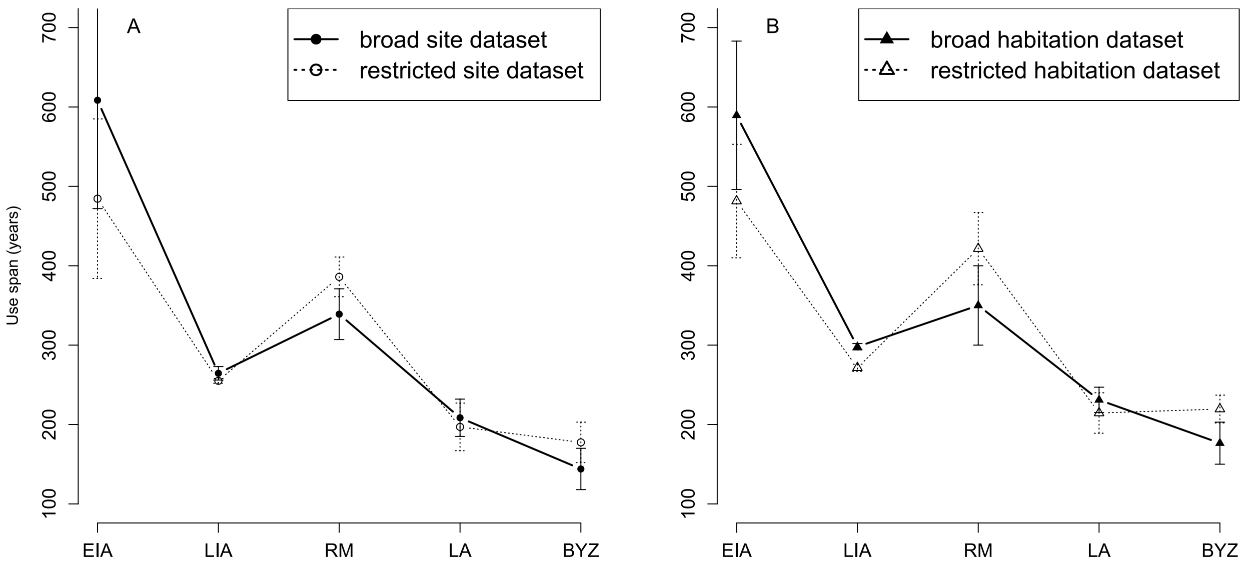


Figure 9.4 Average use span from the Early Iron Age through Early Byzantine period, with one standard deviation range for the broad and restricted (securely dated) datasets of sites (A) and habitations (B).

assigns less variance to the 'restricted to securely dated' estimate, and limits the range in the mean use span to 255±3 years. The exclusion of chronologically uncertain sites shifts the balance between sites known at the beginning of the period (A+B) and those established in the Late Iron Age and continuing into the next period (C+D). This shift in the ratio of site occupation types lowers the site abandonment rate just below site creation rate. This rate reversal leads to a lower average use span in 'certain' (restricted) sites than in the 'uncertain' (broad) dataset during Late Iron Age (see Fig. 9.4). The narrow difference between the site creation and abandonment rates, present in both 'uncertain' and 'certain' datasets, has a stabilising effect on variance (see Table 9.3), reducing the standard deviation in all Late Iron Age estimates (see Table 9.3, Fig. 9.4). In the Late Iron Age, the proportion of short-term sites increases despite a drop in count (from 45% in broad to 47% in restricted dataset). As a result, contemporary to total site ratio drops to 33% (36% in broad dataset), reaching to a global minimum across all periods. The low number of contemporary sites compared to total suggests that communities moved more frequently during the Late Iron Age and settlement dynamics suffered more flux.

During the Roman period, two uncertain sites disappear (9%), but the estimate of simultaneous sites drops only by decimal points from 11.20±1.04 to 10.81±0.70 (3%). This is barely significant as it is still within the range of the standard deviation from the broad estimate. More significant is the lower proportion of type D sites, which increases the contemporary to total site ratio (from 49% to 51%). The impact on mean use span is several decades from an average of 340 to 386±25 years. During Late Antiquity, the disappearance of one site (6%) shifts the estimate of simultaneous sites slightly downward and within standard deviation range. The high proportion of type D sites shifts the average site duration down by one decade from 208 to 197±30 years.

The Early Byzantine period, which in the 'uncertain' dataset was associated with flux, instability, and a low count of simultaneous sites, now shows a trend towards growing mean use span similar to Roman period. The site number drops by three (20%), and the estimate of simultaneously used sites drops to 4.80±0.68 from the previous 5.35±0.96 (10%). Again, the new estimate is within one standard deviation of the old one, but with less variance. Furthermore, with the drop in site count, the ratio of contemporary to total sites increases (from 36% to 40%), suggesting less flux than the broad dataset. The biggest increase, as was the case with the Roman period, is in the mean use span which rises from an average of 144 to 178±25 years.

In summary, the exclusion of chronologically uncertain components has the following effects: Total broad dataset counts in Figure 9.6a suffer an even reduction across all periods (in the range of 6–20%) compared to securely dated site totals. Most of the estimates of contemporaneous sites in the broad dataset remain within the range of one standard deviation of estimates in securely dated dataset, which means that temporal uncertainty is not particularly detrimental to the estimate of contemporaneity. Figure 9.6b shows, however, that number of contemporaries drops by a greater proportion during the Late Bronze Age–Late Iron Age periods (15–30%), than during the Roman through Early Byzantine era (4–10%). Dewar's

Table 9.3 Results of Dewar's model on 'certain' sites in Kazanlak. For legend see Table 9.1

		Occupation span type								
Period	*N*	*a*	*b*	*c*	*d*	*p*	*Eocc*	*Aocc*	*Mean Occ*	*Mean Use Span*
LBA	6	0	1	4	1	500	0.010	0.002	2.7±0.98	1353 (862–1844)
EIA	19	2	3	8	6	500	0.028	0.016	7.76±1.6	485 (384–585)
LIA	34	6	5	7	16	500	0.046	0.044	11.24±0.13	255 (252–258)
RM	21	6	6	4	5	400	0.023	0.028	10.81±0.70	386 (361–411)
LA	18	5	5	1	7	300	0.027	0.040	7.90±1.21	197 (167–227)
BYZ	12	5	1	3	3	300	0.020	0.027	4.80±0.68	178 (152–203)

Table 9.4 Results of Dewar's model on 'certain' habitations in Kazanlak. For legend see Table 9.1

		Occupation span type								
Period	*N*	*a*	*b*	*c*	*d*	*p*	*Eocc*	*Aocc*	*Mean Occ*	*Mean Use Span*
LBA	6	0	1	4	1	500	0.010	0.002	2.75±1.03	1382 (867–1897)
EIA	16	2	3	6	5	500	0.022	0.014	6.75±1.00	482 (410–553)
LIA	27	5	4	6	12	500	0.036	0.034	9.25±0.15	272 (267–276)
RM	15	5	5	2	3	400	0.013	0.020	8.41±0.91	422 (376–467)
LA	13	3	4	1	5	300	0.020	0.027	5.80±0.69	215 (189–240)
BYZ	10	4	1	3	2	300	0.017	0.020	4.40±0.34	220 (202–237)

model reveals more flux in earlier periods than later ones, indicating that the exclusion of temporal uncertainty has a nuanced effect contingent upon period. All in all, certainty produces lower and tighter contemporaneity estimates, and tighter ranges of the mean use span of sites. Shorter mean use span was noted across all periods, except for the Roman period and (less reliably) the Early Byzantine period.

9.3.4 Estimating contemporaneous habitations in the Kazanlak Valley (excluding all uncertainty)

The additional functional filtering of the securely dated ('certain') site dataset to 'certain habitations' further reduces the sample size. Table 9.4 shows that reduction in type D components decreases both the rates of abandonment and establishment, lowering variance in Early Iron Age, Late Antiquity and Early Byzantine periods. Figure 9.5 shows how the reduction in total numbers of 'certain' habitations (as opposed to 'certain' sites) decreases the mean estimates of simultaneously occupied habitations. Comparison of Figs. 9.5 with 9.3 further illustrates that while variance decreases across most periods (Late Bronze Age and Roman periods being exceptions) from 'certain' sites to habitations, the difference between the standard deviations in the 'certain' datasets is not as palpable as it was in the 'uncertain' datasets (see the shorter standard deviation brackets on Fig. 9.5). The drop in the total numbers of Late Iron Age, Late Antique, and Roman period habitations leads to

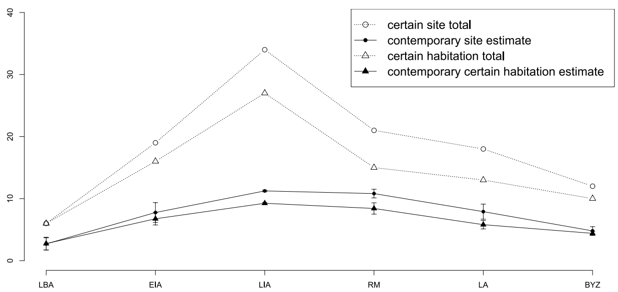


Figure 9.5 Counts of identified versus estimates of contemporary sites and habitations in Kazanlak (excluding uncertain components).

estimates that are lower than one standard deviation from the estimates of sites. The proportion of short-term sites (type D) drops slightly, leading to an increase in mean use span in every period after the Late Bronze Age, and a higher ratio of contemporary to total habitations. While the numbers of contemporary settlements are lower, and their trend remains unchanged (rising until the Late Iron Age and then falling), the 'certain habitation' dataset shows more stability.

It is not surprising that a dataset restricted to securely dated habitations displays more stability than one that includes all sites. Selective subsetting contributes to the higher ratio of contemporary estimates to total counts. The small size of the 'certain habitations' dataset, however, reduces its utility and reliability. The study would be worth repeating on a larger dataset.

9.4 The impact of uncertainty on sites and habitations in Kazanlak

Looking at the impact of temporal uncertainty (reflected in elevation of solid over dotted lines in both Figs. 9.6a and b), it causes inflation across the total counts and contemporaneous estimates in both sites and habitations. The inflation is greater in the estimates of contemporary sites and habitations during the Early Iron Age and Late Iron Age periods, and smaller in the Roman and Late Antique contemporary numbers. This differential inflation does not profoundly alter the trend of settlement growth through the Late Iron Age and decline from the Roman period. When uncertainty is excluded, and inflation cancelled, the Early and Late Iron Age growth in contemporaneous sites and habitations becomes less prominent but does not disappear (Fig. 9.6b). In the total counts (Fig. 9.6a), the inflation is proportionate to the period growth in both functional datasets. Temporal uncertainty has a variable effect on mean use span depending on period, but these differences are, again, consistent in the functionally different datasets. If we compare values in Figure 9.4, temporal uncertainty leads to increased mean use span in Early Iron Age, Late Iron Age, and Late Antique periods and to lower mean use span in Roman and Early Byzantine periods equally in site and habitation datasets.

Functional restriction, plotted as circles and triangles in Figures 9.6a and 9.6b, appears to have very little impact on the total counts or estimates of contemporaries in Kazanlak besides lowering the (N) values in the restricted dataset of habitations across all periods. Habitation values (triangles) follow closely (if below) the values of the broad dataset of sites (circles), in both totals and estimated contemporaries. From this follows that the principal trends visible in the sites remain the same in habitations (see Figs. 9.3 and 9.5). The mean use span in habitations is higher than for sites, but falls within a standard deviation range (Fig. 9.4).

While the impact of functional restriction (visible in solid vs. dotted line in Figure 9.6a and b) is greater in terms of value reduction (ca. 15–30%), its impact is similar across all periods, in both total counts and estimates. The impact of temporal uncertainty (apparent in the difference between arcs of Fig. 9.6a and b) is mostly smaller in absolute numbers (3–20%), but more differentiated by period, especially when it comes to the estimates of both contemporaneous sites and habitations. Figure 9.6b shows that contemporary estimates only suffer a minor reduction of values (expected with a reduced sample size) when chronologically restricted, but a greater reduction when functionally restricted from sites to habitations. In both Figs. 9.6a and 9.6b, the Late Iron Age peak in the sites and habitations is preserved. The peak is, however, rendered much less prominent (on a par with the Roman period) in both functionally constrained and inclusive datasets when corrected for contemporaneity (Fig. 9.6b).

The impact of functional and chronological restriction on occupation span patterns in the four different datasets can be seen in Figures 9.2 and 9.7. The histograms of A–D sequences in Figure 9.7 by period and dataset show variations on the pattern of the broadest dataset in Figure 9.2, namely the high number of D components in the Late Iron Age, C components in Early Iron Age, and A components in the Roman period. The most consistent

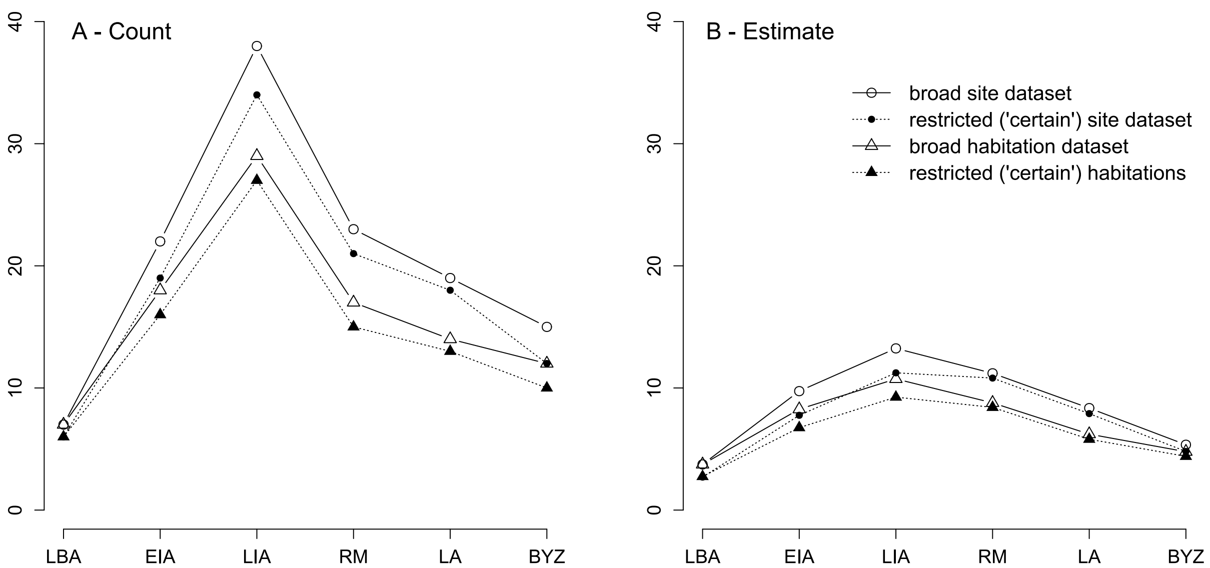


Figure 9.6 A) Total counts of identified sites and habitations, with and without the uncertain components; B) Estimates of contemporary sites and contemporary habitations, with and without uncertain components.

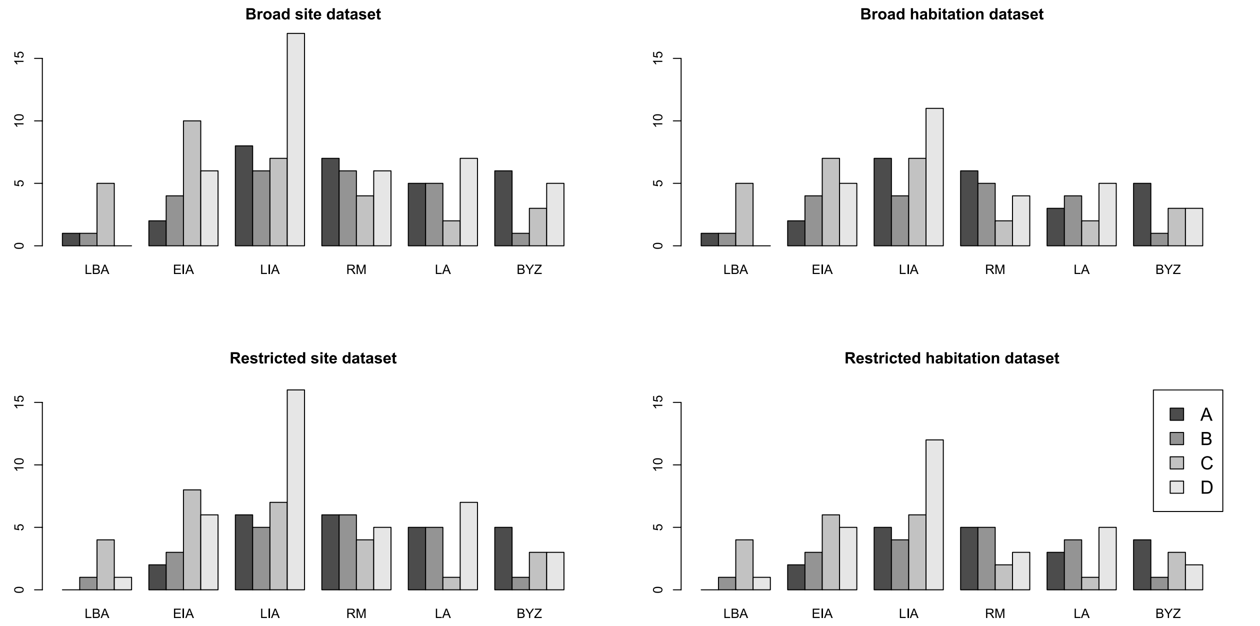


Figure 9.7 Histograms of Dewar's A–D components in the: a) broadest dataset of sites on the left top and b) broadest dataset of habitations on the right, c) chronologically 'certain' sites, and d) chronologically 'certain' habitations, from the Late Bronze Age through Early Byzantine period.

difference between the datasets is that their values drop with each chronological and functional restriction. Fewer short-lived sites appear across all periods when only habitations, and not sites, are considered, a phenomenon explained through the sample size reduction. The restriction of short-term sites (type D) also impacts the sequences with temporal uncertainty, where a site has an uncertain follower and gains C status instead of D status that it has in the restricted 'certain' datasets (compare Late Bronze Age in Fig. 9.7 from broad sites to restricted habitations). All in all, the similarity of occupation span sequences over time demonstrates that functional and chronological restriction do not dramatically alter the nature of these four datasets.

9.5 Contemporaneity in Kazanlak datasets

Dewar designed the contemporaneity model to alert archaeologists to the 'tremendous differences between the estimates of the number of simultaneous occupations in an area depending on the number of type D (single component) occupations' (1991, 611). Even though Dewar's analysis only approximates the probable contemporary site numbers, its results should make archaeologists careful when 'relying on the total number of identified sites in a phase as a basis for judging intensity of occupation. Such estimates may vary widely in their accuracy if comparisons are made between phases with significantly different patterns of occupation span type, and thus with significantly different average spans of occupation' (Dewar 1991, 611).

Dewar's concern with contemporaneity is well illustrated in the Kazanlak (broadest) dataset, specifically in the roughly 50% inflation in total site numbers compared to estimates of contemporaneous sites. This result is not surprising, in that other regions of the eastern Mediterranean also produce large numbers of temporary settlements during survey (Osborne 1987, 57; Bintliff 2000; Fentress 2000; Alcock and Rempel 2006). Dewar's model shows the site-rich Late Iron Age total count to be inflated by 65%, demonstrating that the total count conceals a high proportion of short-term occupations, rather than an expanding population base. While the inflection points in the long-term settlement trend do not dramatically change as a result of Dewar's model, the correction points out periods of high frequency of population movement, such as during the Late Iron Age, which had not been previously apparent.

The application of Dewar's model to four different datasets, restricted along chronological and functional axes, shows that neither chronological or functional certainty change the overall trend of settlement dynamics as shown in the estimates of contemporary sites and histograms of site occupation patterns. The exclusion of functional and temporal uncertainty both lead to reduced values in contemporary sites, which carry the risk of small samples, but show no major changes in kind in the Kazanlak datasets.

The corrected settlement dynamics replace the dramatic peak of the Late Iron Age with a steady and slow growth from the Late Bronze Age through the Late Iron Age, and slow decline in settlement numbers from the Roman

period on. In terms of the post-Roman reduction in contemporary (and total) site numbers, we do not know in which site tier the decline is happening as our sample size is too small to divide the dataset further. Applying Dewar separately to different tiers or estimating total settlement area would be useful for evaluating the possibility of nucleation here.

In summary, Dewar's model enabled us to divide sites into groups by occupation span type and to estimate which periods might suffer from site overfilling. As the overview of sites and habitations from the Late Bronze Age through the Early Byzantine period have shown, only a half of all the sites identified between the Early Iron Age through Late Antiquity likely existed simultaneously.

Many sites detected through survey were non-contemporary, and represented shifting, rather than expanding population. Specific sites could not be identified, so Dewar's analysis does not assist with synchronic pattern evaluation. It rather confirms that the historic period site maps were in reality sparser, and that communities moved with high frequency during Late Iron Age and Late Antiquity, and were more stationary in Early Iron Age and Roman periods. This means care must be taken if judgments of the intensity of occupation in Kazanlak are to be made based on the total number of sites identified. If the assumptions of Dewar's model (consistent rates of settlement establishment and abandonment) apply to the Late Iron Age as well as other periods studied here, it would be safer to assume gradual growth in settlement intensity and population increase consistent with previous periods.

9.6 Conclusion

Dewar's model was used to estimate site occupation spans from the Late Bronze Age through the Early Byzantine period, and to estimate the numbers of contemporary settlements during each period. This analysis contrasted the high total site numbers against the relatively few contemporary sites during the Late Iron Age, indicating the prevalence of short-term habitation. The evidence of ephemeral activity and predominance of short occupation spans during the Late Iron Age confirms that total site count needs to be used cautiously in assessments of regional population growth. The high site counts may result from actual increases in the number of settlements (and a higher population) or, as is the case in Kazanlak, from frequent population movement, reflecting social preferences or subsistence pressures favouring shorter-term settlements.

9.7 R code repository

For code used to generate the results see: https://github.com/adivea/RScripts

Note

1 Kazanlak site table DOI: https://doi.org/10.6078/M73T9F9D

10

Spatial variability in surface artefact distributions in the Kazanlak Valley

Adela Sobotkova

Abstract *This chapter presents the results of spatial analysis conducted on a surface survey data from the Tundzha Regional Archaeology Project (TRAP) in the Kazanlak Valley. It characterises the dynamics of settlement patterns in the valley and reviews factors contributing to them. Diachronic variation in the spatial distribution of human activities in the Kazanlak Valley indicates that both natural and social drivers shaped the locational preferences of past communities within this intermontane landscape. In most periods, site distributions depart from spatial randomness. In the long term, site numbers periodically grow and decline, pointing to changing demographic trends and habitation preferences. Prehistoric settlement patterns seem governed by environmental and economic factors, while socio-political circumstances dominate historical periods. Site dispersal and aggregation are correlated with shifts of political autonomy from local communities to supra-regional polities and vice versa. Given the limitations of survey data and the diachronic approach, the analysis provides a bird's-eye view of developments in Kazanlak. These results provide context for future explorations of specific periods and sites at a finer scale using other approaches.*

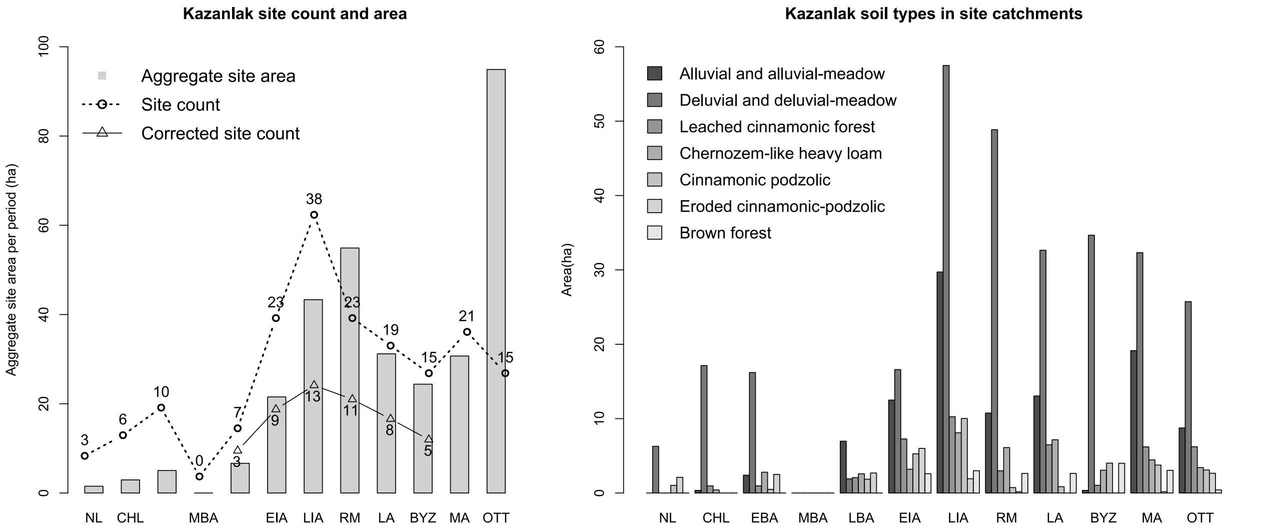
Keywords *spatial statistics; multi-scalar analysis; diachronic settlement patterns; cultural and environmental history; competition*

10.1 Introduction

Bulgarian analyses of survey data to date have focused on synchronic settlement preferences, site type variation, and population dynamics (Gotsev 1997b; Archibald 2000; Leshtakov 2002; Chankowski and Gotsev 2002). Single-period studies can offer an in-depth exploration of site variability across a regional, or even larger, dataset of sites.

This chapter instead presents a diachronic assessment of the spatial variability in the Kazanlak Valley survey dataset produced by the Tundzha Regional Archaeology Project (TRAP) to characterise the evolution of past human settlement in this intermontane landscape. First, each chronological period is examined on its own, exploring patterns in site dispersal and aggregation at different scales. Next, results are compared with the preceding and succeeding periods, and site growth or decline over time is translated into general population trends. Finally, the contribution of social and natural factors to the formation of the archaeological record and to changing habitation patterns is considered.

When discussing each period, the focus is on changes in site numbers, their spatial relationships, and environmental context, especially soils and local topography. Across periods, site continuity is assessed, and where the size of the dataset permits, geospatial statistics are applied to sites of a given period, regardless of ascribed function. Each section of this chapter assesses the persistence of cultural material at a given site over time. A processual approach is used to frame questions and interpret results. Following this approach, the variation in spatial and temporal distribution of human activities is seen as adaptation to changes in both natural circumstances and socio-cultural systems (Flannery 1976; Earle 1976). To assess this variation, I combine standard geostatistical methods (Nearest Neighbour, Ripley's K) to investigate trends in site aggregation and dispersal at multiple spatial scales, and then compare the results across the long term using locational theory as the basis for my interpretive framework (Hodder and Orton 1976; Haggett *et al.* 1977; Bevan and Conolly 2006). The core themes discussed in the chapter relate to subsistence strategies, demography, and social organisation.



a b

Figure 10.1 Kazanlak Valley survey results: a) site counts, aggregate area, and estimates of contemporaneous sites from the Neolithic to the Ottoman period; b) soil types represented in 1 km catchments around Kazanlak Valley sites from the Neolithic to the Ottoman period.

Figures 10.1a and 10.1b illustrate the main diachronic trends in the Kazanlak survey data: slow growth during the Neolithic to the Early Bronze Age ends with a Middle Bronze Age hiatus. Dramatic growth during the Late Iron Age and the Roman period slows down during the Early Byzantine period, followed by a Mediaeval revival and Ottoman prosperity.

10.2 Kazanlak Valley site distribution

The main output of the survey comprises a continuous distribution of artefact counts (at least in areas where intensive survey was possible; see Chapter 3). Such a dataset makes it possible to undertake a variety of analyses, from fine-grained artefact-based approaches (Kuna 1998; Bevan and Conolly 2006) to site-based spatial analysis, where sites are defined from surface artefact concentrations (Renfrew and Wagstaff 1986; Cherry *et al.* 1991; Jameson *et al.* 1993). In this chapter, as an initial benchmarking exercise, the latter is undertaken. Sites, represented by points, are treated as interpretations derived from surface artefact patterns rather than primary phenomena (again, see Chapter 3 for further discussion). The analyses conducted here include: (1) relationships between contemporary sites at multiple scales using Nearest Neighbour and Ripley's K statistical methods; (2) correlations between environmental variables and sites; and (3) evolution of site distribution over time in the context of social and environmental change. More specifically, I evaluate the degree of site clustering and dispersal at different analytical scales, relate the outcomes to social competition, cooperation, and resource availability during a given period, and explore these synchronic patterns over time to identify changes in social and human-environment interactions.

10.2.1 The locational approach

In this chapter, geostatistics are applied to Kazanlak Valley sites to distinguish past human locational preferences from dynamic processes operating at multiple scales (*e.g.*, 'budding' of daughter settlement from mother sites), and to assess levels of cooperation and decision-making reflected in the spatial organisation of past communities.

This approach rests on locational theory, which provides tools for the discovery and explanation of patterns that underlie spatially distributed systems. 'New' geographers developed locational theory and associated approaches to translate spatial regularities into human behaviour predicated on assumptions of rationality and efficiency (Lösch 1954; Isard 1956). Once elaborated (Haggett 1966), locational theory was adapted by neo-evolutionary archaeologists to identify the process of social evolution in the archaeological record. Johnson (1973) suggested that variation in site surface area within a region corresponds directly to hierarchical levels of decision making in local polities. Earle (1976) used locational approaches to map the diachronic shifts in competition and authority in Mesoamerica. Flannery (1998) suggests formal archaeological measures in both mortuary and settlement records that can be applied as rules of thumb for the emergence of states. More recently, Bevan and Conolly (2006) apply quantitative multiscalar analysis to the Kythera survey dataset to characterise settlement patterns at different scales.

Smith (2003, 42) has critiqued locational theory for reliance on a 'mechanical ontology of space, a commitment to explaining regularities and variation in spatial patterns in terms of a universal geometry of settlement determined, in the last instance, by the logic of socio-evolutionary process'. Duffy (2015) has likewise argued that site size hierarchies can arise from a variety of social and economic

processes, including warfare, fission, and seasonality. If different mechanisms can leave the same footprints in the landscape, explanations emphasising socio-political complexity may be overused. Finally, Smith (2003, 43) argues that while locational analysis describes the spatial aspects of material correlates to complex polities, it does not explain the evolution of the polities or how the polities functioned. Recognising these limitations, I characterise, rather than explain, spatial patterns in Kazanlak.

While these critiques have both complicated and expanded the interpretation of regional spatial patterns in survey datasets – and offered productive directions for future studies – a multifaceted study of alternative explanations of the sort advocated by Duffy (for example) is beyond the scope of the diachronic overview presented here. To get beyond mechanistic application of locational analysis, I relate my results to the environmental and topographic particulars of the landscape, consider social factors, and apply a range of statistical approaches.

Finally, locational theory has practical constraints when applied to survey data. The existence of non-contemporary sites, for example, poses problems for methods that work best on static systems. The coarse chronology of survey data obscures the number of sites that existed at any given time. The probabilistic modelling presented in Chapter 9 mitigates this error as it estimates contemporaneous sites. Such modelling, however, fails to specify which settlements were contemporary, a problem for point-based spatial statistics. A second issue related to coarse chronology is that not all socio-political changes leave marks in space. Braudel's remark that the 'long term wins in the end' (1973, 1244, cited in Hodder 1987, 8) is appropriate, since we can expect that only exceptional or long-lasting processes will register in the surface archaeological remains.

10.2.2 From artefact scatters to sites

Given the considerable variability of the survey site dataset, a brief review of how the dataset was processed is essential for the reproduction of my analyses. Sites in this chapter are represented by points, which approximate the centre of surface artefact distributions whose boundaries, nature, and chronology can be reviewed in Chapter 8 and the Kazanlak site catalogue.[1] Except for settlement mounds and fortified sites, the function of the surface distributions in Kazanlak comes with a degree of uncertainty. Although some larger concentrations with the remains of daub, tableware, storage ware, and cookware may represent the remains of a permanent habitation, such as a hamlet or a village, this function could have changed over time. TRAP trial excavations at select concentrations (Nekhrizov and Tzvetkova 2010; Bozhinova 2010) as well as past excavations at Seuthopolis (Dimitrov and Čičikova 1978), the prehistoric tells of Gabarevo, Kazanlak, and Kran (Mikov 1933a; Leshtakov 2005; Nikolov *et al.* 2010; Andreeva and Anastasova 2014), and Roman sanctuaries (Tabakova 1959; Tabakova-Tsanova 1959; 1960; 1980; see Chapter 6 for a full bibliography) testify to the functional variety of remains over time despite similar composition of surface distributions. All suspect settlements, small and large, were nonetheless included in the analysis. Mortuary sites (burial mounds), on the other hand, were excluded, mostly because their dates are unknown. Special purpose concentrations, such as quarries, shrines, and ceremonial areas are included. All in all, this chapter combines evidence from settlements with that from other types of sites for the purpose of analysis.

In terms of temporal uncertainty, the benefit of the doubt was given to components whose date was suspect because of poor material preservation. Rationale for the liberal approach is based on TRAP test excavation results. Unlike Whallon (1979, 288–399) or Redman (1987) who found clear links between surface distributions and excavated remains, TRAP excavations in Kazanlak tended to reveal more chronological components below surface than surface collections indicated (Nekhrizov and Tzvetkova 2010; Bozhinova 2010). Sites with coarse chronological resolution were normalised to the analytical units listed in the 'Absolute chronology' included at the beginning of this volume, and where ambiguity remained, an expansive interpretation was adopted. For example, at a site whose material was identified as dating to 'Classical Antiquity' (fifth century BC through fourth century AD), I included the site in both the Late Iron Age and Roman period, as it could potentially have been occupied during both. The chronological reliability of pottery analysis in Kazanlak differed with each period, and unlike Bevan *et al.* (2013) we recorded temporal certainty simply as a binary value (certain, uncertain), rather than assign to the artefacts the probability of belonging to different periods. In general, early periods are less reliably dated, and likely underestimated due to poor artefact survival (with one exception being highly visible and recognisable Chalcolithic pottery). At the other end of the timeline, sites from recent periods are sometimes masked by modern settlements, a lack of Ottoman expertise during fieldwork, or low artefact productivity (especially for the Early Byzantine period and First Bulgarian Kingdom). A conclusion can be drawn that the two millennia from the Late Bronze Age to the Roman period have been defined with the most certainty, because these periods (a) produced a relative abundance of diagnostic pottery (ten fragments per site on average), (b) suffered less deterioration of surface materials than earlier periods, (c) were less masked by modern settlements, which follow a different pattern, and (d) were the subject of researchers' expertise.

Site distribution maps in this chapter reduce the information from surface concentrations into the graduated symbols of site size, or into histograms of recovered diagnostics.[2] The extent of individual chronological site components (where sites have multiple chronological components) is represented by circles of varying sizes, classified to one of five tiers (following Chapter 8). The circles, inevitably, represent the best estimate of individual component extent, derived from the density of diagnostic

artefacts at a given site, the total area of a concentration, total number of chronological components, and their environmental setting. The sites that yielded diagnostics can be reviewed in Kazanlak site table[3] as well as in the Kazanlak site catalogue.[1] Additional information has been included in the maps to provide contextual information for settlements (*e.g.*, the location of burial mounds), although again chronological coarseness makes the association of sites and other features uncertain.

As asserted in Chapter 9, site distribution maps are static, cumulative representations of the record that are likely to overestimate the number of contemporary sites in any given period. As noted above, while Dewar's model provides a useful aggregate correction, it is less helpful for synchronic analysis like this one since it does not identify which sites are contemporary. Given this limitation, I use the entire, uncorrected dataset for analysis, assuming that underestimation due to site loss balances the overestimation produced by coarse chronology. By plotting sites and their soil resources in a diachronic sequence, and by combining two to three phases in a comparative discussion, I illustrate the dynamic cultural and environmental processes of human interaction with the landscape.

As an addendum to the maps, site histograms and tables of site size ranks organised by period accompany each period under discussion (Fig. 10.2, Tables 10.1–10.3). The bins in the histograms are 0.5 ha. The tiers (or 'ranks') I discuss are my own, representing what I consider meaningful breaks in site size. The first tier of 0.1–0.5 ha covers 'tiny' sites. Small sites follow at 1 ha, medium at 1–5 ha, large at 5–10 ha, and extra-large at greater than 10 ha. Since not all sites were occupied simultaneously, these histograms, like the maps, provide an aggregate snapshot of each period. To offset this simplification and account for site contemporaneity, the discussion considers how the reduction stemming from Dewar's correction might affect the distribution.

10.2.3 Two-dimensional spatial patterns

The large size and boundedness of the Kazanlak Valley study area (unlike that of Yambol, see Chapter 16) lends itself well to analytical methods utilised for two-dimensional spaces. Archaeologists routinely draw on biological or geographic methods of assessing clustering and dispersal in spatial phenomena (Evans and Clarke 1954; Pielou 1959; Getis 1964; Miller and Stephen 1966; Haggett *et al.* 1977). These methods include geostatistical techniques of Nearest Neighbour analysis, multiple cluster analysis, or correlations between sites or other social phenomena and environmental variables (Fortin and Dale 2005). The spatial patterning of sites is frequently described in terms of three idealised states: clustered, regular, or dispersed patterns (Hodder and Orton 1976,

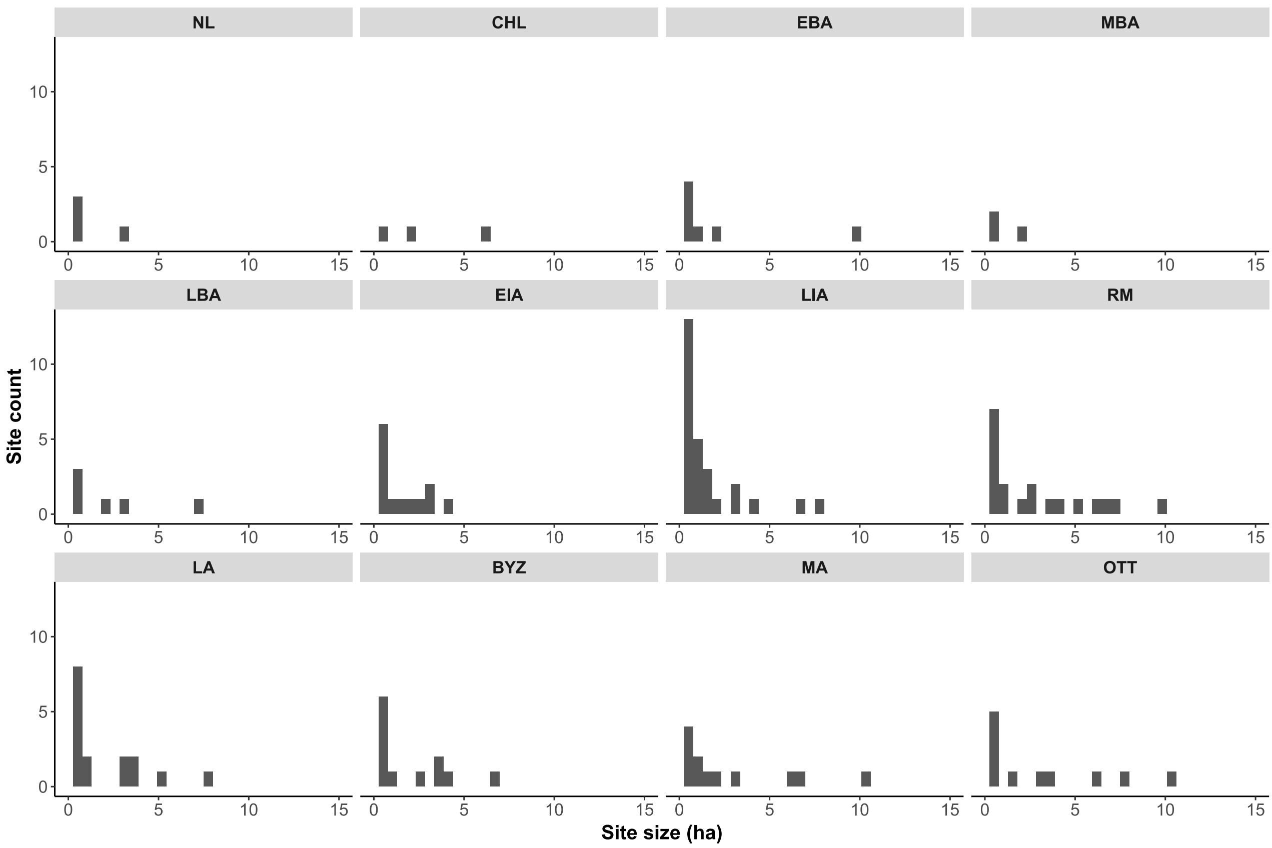


Figure 10.2 Kazanlak site size histograms over time.

Table 10.1 Kazanlak site aggregate area, count, and average area over time

Period	*NL*	*CHL*	*EBA*	*LBA*	*EIA*	*LIA*	*RM*	*LA*	*BYZ*	*MA*	*OTT*
Aggregate Area (ha)	1.5	2.9	5.0	6.7	21.5	43.3	54.9	31.2	24.4	30.7	94.9
Site Count	3	6	10	7	23	38	23	19	15	21	15
Avg Area (ha)	0.5	0.5	0.5	1.0	0.9	1.1	2.4	1.6	1.6	1.5	6.3

Table 10.2 Kazanlak site count by size rank over time

Site size ranks	*NL*	*CHL*	*EBA*	*LBA*	*EIA*	*LIA*	*RM*	*LA*	*BYZ*	*MA*	*OTT*
Tiny (<0.5 ha)	2	5	8	4	12	21	9	11	7	11	6
Small (0.5–1 ha)	1			1	5	6	4	1	3	3	1
Medium (1–5 ha)		1	2	2	6	9	5	5	4	5	5
Large (5–10 ha)						2	5	2	1	1	1
XL (>10 ha)										1	2

Table 10.3 Kazanlak site aggregate area by size rank over time

Site size ranks	*NL*	*CHL*	*EBA*	*LBA*	*EIA*	*LIA*	*RM*	*LA*	*BYZ*	*MA*	*OTT*
Tiny (<0.5 ha)	0.81	0.87	1.89	1.06	1.73	4.94	2.22	3.30	1.68	1.54	1.43
Small (0.5–1 ha)	0.71			0.58	3.43	4.71	3.00	0.83	1.97	1.91	0.57
Medium (1–5 ha)		2.07	3.15	5.02	16.37	19.34	15.32	14.41	14.04	10.46	14.48
Large (5–10 ha)						14.33	34.37	12.65	6.70	6.70	7.94
XL (>10 ha)										10.09	70.50

Table 10.4 Kazanlak site average area by size rank over time

Site size ranks	*NL*	*CHL*	*EBA*	*LBA*	*EIA*	*LIA*	*RM*	*LA*	*BYZ*	*MA*	*OTT*
Tiny (<0.5 ha)	0.41	0.17	0.24	0.26	0.14	0.24	0.25	0.3	0.24	0.14	0.24
Small (0.5–1 ha)	0.71			0.58	0.69	0.79	0.75	0.83	0.66	0.64	0.57
Medium (1–5 ha)		2.07	1.58	2.51	2.73	2.15	3.06	2.88	3.51	2.09	2.9
Large (5–10 ha)						7.17	6.87	6.33	6.7	6.7	7.94
XL (>10 ha)										10.09	35.25

fig. 3.1). Real-life data distributions rarely fit one of these states neatly (van Andel *et al.* 1986); the clustering or dispersal is relative and depends on the scale at which the analysis is conducted (Earle 1976; Bevan and Conolly 2006; Locke and Molyneaux 2006). A regular pattern between uniform sites has been interpreted as a sign of rivalry between communities (Earle 1976, 207; Hodder and Orton 1976, 54–85), arising from demographic growth (Getis 1964; Perles 2004, 132–47) or competition over spatially bounded resources (Pielou 1962; Earle 1976, 200). Clustering of sites can indicate attraction between settlements, attraction to a localised resource, or the emergence of larger-scale polities or regional centres (Evans and Clarke 1954; Earle 1976, 207–12; Roberts 1996; 15–37).

Given that in this chapter points were chosen as representations of sites, Nearest Neighbour analysis is used to detect clustering or dispersal at the largest available scale: the level of the Kazanlak Valley as a whole. This statistic was originally developed by ecologists Clark and Evans (1954) to measure the distribution of plant populations. It is straightforward and produces a descriptive, easy-to-interpret coefficient (see Table 10.5). The Nearest Neighbour statistic measures the distance from a given point to its first Nearest Neighbour. It then compares the mean distances observed between points (rA) with the expected point distances (rE) in a given study area (Clark and Evans 1954, 447). The result is a ratio (R), which can fall either above or below one. If it falls above one (R>1), it indicates that spatial phenomena are more dispersed than would be expected of a random distribution. If the ratio is below one (R<1), then the dataset is more aggregated than it would be if random. The Nearest Neighbour analysis is highly dependent on the size of study area and suffers from edge effects. A larger study area can make the dataset look aggregated, while a smaller

Table 10.5 Nearest neighbour index of Kazanlak sites over time

Period	*NL*	*CHL*	*EBA*	*LBA*	*EIA*	*LIA*	*RM*	*LA*	*BYZ*	*MA*	*OTT*
NNA Ratio	0.196	0.341	0.746	0.538	1.053	0.896	0.866	1.015	1.104	1.053	0.866?
Elite sites	–	–	–	–	–	1.29	0.849	–	–	–	–

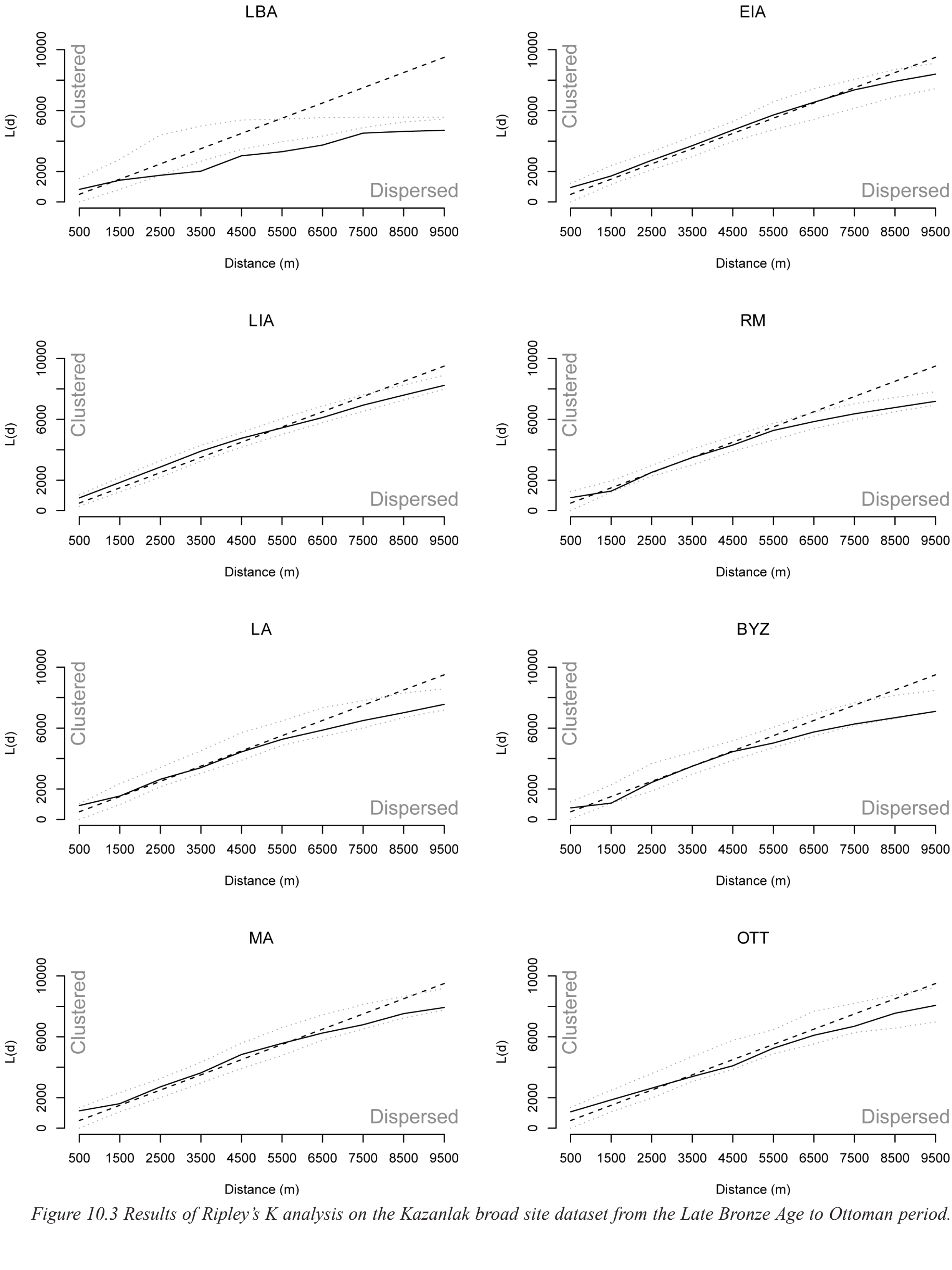


Figure 10.3 Results of Ripley's K analysis on the Kazanlak broad site dataset from the Late Bronze Age to Ottoman period.

study area will artificially increase the Nearest Neighbour ratio so that it looks dispersed (Hodder and Orton 1976, 41). Missing sites and edge effects will increase the mean distances between sites. While the Kazanlak survey area was covered contiguously and completely, it contained one gap, which made sites look more dispersed. To remedy the study area dependency of Nearest Neighbour analysis, larger values were substituted into this parameter, from the strict 'actually walked sample' of 86 sq km to 'area represented by the walked sample', a 200 sq km bounding box surrounding the survey area corresponding to the Kazanlak Valley as a whole. This adjustment produces the most meaningful results for interpretation of site distribution at the scale of the study area.

Another problem with the application of the Nearest Neighbour statistic to regional survey data arises from its underlying assumption of spatial uniformity of archaeological phenomena. Given that the archaeological distributions are spread across a landscape with heterogeneous topography and unevenly distributed natural resources, spatial uniformity cannot be assumed across the surface or at different scales. To account for spatial inconsistency, the high-order Nearest Neighbour analysis is complemented with Ripley's K-function, designed to be inherently multiscalar (see Fig. 10.3).

Ripley's K-function passes a circular moving window through the points in the dataset and checks at various intervals the amount of points that fall inside and outside this radius (Ripley 1976; Dixon 2002). Comparing the observed to the expected number of neighbours (lambda(k)), the function identifies relative aggregation and dispersal of point data at different scales. Aggregation is signalled by values falling above the diagonal 'expected' line, dispersal by values below the 'expected' line (see Fig. 10.3). The aggregation or dispersal represent deviations from spatial homogeneity in a plane. This 'homogeneity' is derived from a Monte Carlo simulation of the point distribution and displayed as a function l(k) in the graph, with a confidence envelope, generated by 99 random permutations on the existing point values (translating into 99% confidence level). The envelope of confidence indicates how statistically significant the results are at individual distances. If the values fall inside the simulation envelope, it means the result is not very different from what we get if the points are distributed randomly in the study area. Ripley's K, just like Nearest Neighbour, is sensitive to edge effects and the size of study area. The 'minimum enclosing rectangle' option was used in ArcGIS to provide a variable bounding area for period-specific datasets while running the function. ArcGIS also offers to correct for edge effects by generating simulated values beyond the study area boundary. Given the gap in TRAP survey coverage, this option was chosen, thus simulating sites on the outside of the moving window to remedy the edge effects. Even then, the confidence envelope generated by the simulation consistently falls below the expected line, signalling the effect of the enclosing boundary. When running the function, the moving window was set to start at 500 m radius, increment by 1000 m, and repeat ten times for each chronological component in the dataset. A maximum radius of 10 km was used (the 'final radius' in Ripley's K). The lower-radius outcomes of Ripley's K illustrate spatial patterns at the local scale, mid-range outcomes intermediate scale, and higher-radius outcomes the scale of the valley as a whole.

When applying these methods, site function is usually disregarded because the sample size in most periods is too small to tolerate additional subsampling. For the same reason, and because Dewar's correction does not indicate which sites were occupied during any given period, the 'broad' site dataset was used as if all sites were contemporary (Chapter 9). Even using the largest sample available, results of Ripley's K and Nearest Neighbour analyses are not statistically significant for some periods.

10.3 Early Settlement Overview: Neolithic to Late Bronze Age

The earliest traces of human habitation in Kazanlak were found at 21 surface artefact concentrations, assigned from the Neolithic to the Late Bronze Age (6200–1100 BC).[4] Two of these concentrations were associated with known settlement mounds (Kran-4118, Sheynovo-4130; Tabakova-Tsanova 1991, 122; Nikolov *et al.* 2010). An additional two coincided with terrain waves, which resembled low settlement mounds, but have not been confirmed as such (2045 and 2034). Most prehistoric concentrations (17 of 21) were small (< 1 ha) and low-density without any associated earthworks. In 14 cases, the concentrations contained fragments of grinding stones, or daub (or both), indicating both food processing and at least semi-permanent structures and, therefore, these concentrations are likely to represent settlements. Seven concentrations comprised very few pottery fragments. Without excavation the character of activities that produced those seven concentrations remains elusive.

Most of the documented artefacts were handmade, highly fragmented, and stripped of their surface, hindering identification. As a result, only a coarse chronological resolution was possible. In five cases, concentrations could only be classified as 'prehistoric', based on highly weathered, unevenly fired, poorly sorted fabric, which was processed by hand into an uneven form. Of the 16 concentrations where more precise dating of ceramics was possible, three yielded Neolithic ceramics. Five contained Chalcolithic pottery (an additional one included uncertain Chalcolithic remains). Ten contained Early Bronze Age ceramics (see Fig. 10.1a for site aggregate area). Identifiable Middle Bronze Age ceramics were particularly elusive; only two concentrations contained uncertain examples of Middle Bronze Age ceramics. Late Bronze

Age pottery was securely identified in five concentrations and suspected in an additional two cases. On average, only five to six habitations or activity areas appear to have been in use during any given prehistoric phase. Considering that each prehistoric phase was a millennium or more long, few sites seem to have existed at the same time in the Kazanlak Valley. This apparent emptiness, however, likely reflects poor preservation, burial or destruction of sites, or other biases, rather than the prehistoric situation.

10.3.1 Change and continuity from the Neolithic to the Early Bronze Age

Three Neolithic concentrations documented during the TRAP survey (4130 Sheynovo tell, 4131 a surface concentration associated with a tell, and 3053 a flat surface concentration) show that pottery producing sedentary communities lived both in long-term, well-established settlements, as well as in the surrounding landscape. Sheynovo tell likely saw its first community of occupants, whose settlement started the growth of the artificial mound. At the other locations, only one to two diagnostic sherds were discovered, hindering better assessment of the function of these early flat concentrations.

During the Chalcolithic period, human activity can be seen at five findspots. The pre-existing site 4130 grows in size and ceramic output. Four new sites bud off in its vicinity, colonising the northeast part of the study area (4118, 4112), and valley floor, roughly correlating with an old river terrace north of the Tundzha River (4152, 2045). This expansion of settlement and activity is concentrated within the valley floor; no materials are documented in the Sredna Gora or Stara Planina at this time (this is not the case elsewhere in Bulgaria *cf.* the Struma Valley, where prehistoric settlement flourishes in the mountains, see Grebska-Kulowa and Kulow 2007). The village at the Sheynovo tell is now joined by settlers at tell Kran (4118). Here the Chalcolithic occupation is suspected rather than proven (see Andreeva and Anastasova 2014). Special purpose sites or shorter-term settlements are represented by three new flat concentrations (2045, 4152, 4112). The last is uncertain, as it may be a result of redeposition during Classical Antiquity.

The labour-intensive surface treatment and characteristic decoration of Chalcolithic pottery facilitated the discovery and identification of more diagnostic fragments at these sites than at their Neolithic predecessors. Despite the increase in site count and use area from Neolithic to Chalcolithic period, the number of Chalcolithic findspots is still small for the total survey area. The ratio is one site per 17 sq km of survey area (or one per 12 km of valley floor). Post-depositional processes, especially the alluvial and colluvial dynamics of the valley, likely conceal Chalcolithic activity (*cf.* Chapter 7).

Moving into the Early Bronze Age, the number of sites increases to 10 Distribution of Early Bronze Age sites.[5] The site types still follow the well-established categories of village occupations at tells (Sheynovo and Kran) and special purpose sites or shorter-term occupations or activity areas at eight surface artefact concentrations. Two of the latter are associated with the tells (4131, 4112) and others represent stand-alone concentrations (2045, 1015, 3059, 4152, 4113, 4117). Only four Early Bronze Age sites yielded more than 10 diagnostics. All but one prehistoric site continued to be in use during the Early Bronze Age (3053 has no evidence of later reuse). As excavations at the tell sites show, this continuity probably does not mean uninterrupted use, but rather repeat revisits or resettlement (Leshtakov 2005, 442).

The abandonments and hiatuses are confirmed by the TRAP trial excavations at both 2032 and 3055 (Bozhinova 2010; Nekhrizov and Tzvetkova 2010). At 2032, a Neolithic layer was revealed 0.8 m deep below surface at an Early Iron Age surface concentration. At 3055, a late Chalcolithic (typologically speaking) layer was separated by 40 cm of sterile soil from its Early Iron Age surface antecedent. The pottery was heavily worn and softened by soil chemistry; surface decoration flaked off if not handled carefully. At both sites, the discovery of deeper strata came as a surprise, since we found no Neolithic or Chalcolithic materials on the surface, despite re-surveying sites in preparation for excavation and conducting total-pickup samples (at 2032) above the designated excavation areas. The discovery of prehistoric material at 2032 and 3055 underscored the existence of a hidden archaeological landscape in Kazanlak that may only be partially and intermittently revealed by surface survey, and reinforced the bias towards younger periods.

Overall, the survey results for Neolithic to Early Bronze periods confirm that both long and short-term settlements existed in the valley, and that human activity took place throughout the landscape. On average, one to three ephemeral sites were detected for each long-term prehistoric site within our study area. Given the evidence of buried earlier layers in flat sites, this ratio of ephemeral to permanent sites is likely grossly underestimated, especially the deeper in the past we go. Corresponding to expectations, more material survives from the Early Bronze Age than from the Neolithic.

10.3.2 Topography and environment

When looking at the topographic and environmental context of the prehistoric sites, two phenomena characterise their long-term trajectories: expansion and differentiation (see the first three barplots in Fig. 10.1b). When referring to differentiation, the increasing variety of soils in site catchments can be observed as well as changes in the topographic and environmental setting of sites within the valley, classified into three major zones: (1) the flat valley floor covered with deluvial soils that stretches from the old Tundzha River terraces to the foothills of Stara Planina, (2) the Tundzha River terraces with well-watered heavy riverine soils, a variety of arable and forest resources,

and good vistas, and (3) the hills and terraces of Sredna Gora with eroded, leached and cinnamonic forest soils, visual prominence and variety of resources.

10.3.2.1 Preferred settlement area on the valley floor

The valley floor comprises roughly a third of the TRAP study area. The valley is relatively flat, with a southern aspect, and sloping from ca. 500 m on its northern edge to ca. 350 masl at the reservoir. It would have had a light oak forest (see Chapter 13) through prehistory. Sites located here would have been visible from the mountain slopes, but would not be particularly prominent when viewed from other places within the valley. Neolithic communities favoured the valley for settlement, while the river environs and hills of the Sredna Gora see settlement only with Chalcolithic and Early Bronze Age communities. This preference contrasts with contemporary settlement record in other places in Bulgaria and Greece, where transitional, high diversity areas are preferred (Dennel and Webley 1975; Halstead 1984, 6.4.3; *cf.* Perles 2004, 121–2; Grebska-Kulowa and Kulow 2007). This contrast may be due to post-depositional processes in Kazanlak, or to the fact that the Kazanlak Valley is compact and fairly elevated (350–500 masl) compared to other low-lying valleys, such as around the Maritsa River near Nova Zagora (100–200 masl, subject of Dennel and Webley 1975). Its intermontane character makes the Kazanlak Valley floor into a transitional ecological zone, like others favoured by prehistoric communities in southwest Bulgaria.

The valley floor in Kazanlak is dominated by deluvial soils (or, Colluvisols, in the new official FOA 1990 terminology, see Ninov 2002, 282, in Chapter 5), spreading from the north banks of the Tundzha River to the foot of the Stara Planina where gravity and mountain streams erode the mountain and form large deluvial (colluvial) fans. As a result, most soils in the valley are light and not as fertile as riverine soils, but easily workable, providing a highly suitable environment for hoe agriculture and gardening (Dennell and Webley 1975, 100). The barplot of soils available within 1 km catchment of all prehistoric sites shows that the deluvial soils comprise the largest fraction from the Neolithic to Early Bronze Age (Fig. 10.1b). Two of the Neolithic sites, the Sheynovo tell (4130) and associated concentration 4131, are located near the geographic centre of the valley floor, at an altitude of 400 masl. Besides the well-drained deluvial soils, the sites are flanked by two fresh mountain streams and have, within one hour of walking, access to the mountain resources of the Stara Planina. The few Chalcolithic and Early Bronze Age sites on the valley floor share the same topographic setting and resources with the Sheynovo tell, underscoring both the popularity of the valley floor environment and its contribution to the preservation of the prehistoric material.

10.3.2.2 Tundzha river terraces and the Sredna Gora

The Tundzha River and its Quaternary terraces separate the valley floor from the Sredna Gora. The river terraces are covered in riverine soils, heavier and more fertile products of the fluvial activity (Fluvisols; see Chapter 5, 'Soils'). The heaviness of these soils makes them harder to till (*cf.* Dennel and Webley 1975), which may be one of the reasons the river terraces became popular in later periods, such as the Early Bronze Age (with sites 1015, 2208, 2198, 2032).

Two Neolithic communities are known (from excavations) on the border of the riverine and deluvial soil zone (2032 and tell Kazanlak respectively). They enjoyed a southwesterly aspect, and a view over the river valley. Excavation indicated that site 2032 saw a long hiatus after the Neolithic period, with habitation returning only in the Late Bronze Age/Early Iron Age period. No Chalcolithic sites are known in this zone. Only from the Early Bronze Age on do the farming communities in the valley resettle the river bank, perhaps because new technology and subsistence strategies allow them to better exploit heavy soils and diversified resources in the riverine zone.

The transitional zone of the Sredna Gora forms the southern edge of the valley, rising from the Tundzha River bed to the south. Sredna Gora sectors within TRAP survey fall within similar elevation range as the valley (350–600 m), but the hilly terrain contrasts with the sloping plane of the valley. The hills are covered by mixed deciduous forests, and feature eroded cinnamonic forest soils (Luvisols according to FOA 1990). The soils are of poor quality and low fertility, but light and easy to work with Neolithic techniques. Sandy riverine soils are available in the valleys of local rivulets, such as the Gyurlya, a southern tributary of the Tundzha River.

The northern slopes of Sredna Gora were not very popular with prehistoric communities. Only one Neolithic site (3053) appears on a terrace in the Sredna Gora, followed by another (3055) during the Chalcolithic (judging by formal analysis of excavated pottery, not surface data) and another one or two (3059, 3055 judging by C14 data) during the Early Bronze Age, on both the Tundzha River terraces and the Sredna Gora. These concentrations lie near each other, occupying neighbouring terraces with southern and eastern aspects at ca. 380–400 masl. Despite poorer conditions for arable agriculture (i.e. the need for terracing, poor soil quality), communities gathering here enjoyed a greater variety of resources and better view than Neolithic sites such as Sheynovo or 4131.

10.3.3 Diversity of resources

The sample size of prehistoric sites in Kazanlak is small and the uniform topographic and environmental circumstances of most prehistoric sites therefore may not be representative. The formation of tells, however, as well as evidence of reuse of flat concentrations, suggest that the environmental pattern to site locations

is non-random (Dennell 1978). The locations were selected, and settlements maintained or reused because local circumstances were advantageous for settled life and remained popular with farming communities in later periods.

Early farming communities show a preference for environments conducive to gardening agriculture and near forests and streams. Deluvial soils prevail in the catchments of all Neolithic, Chalcolithic, and Early Bronze Age sites. Only trace amounts of other soils, forest or riverine, appear in the prehistoric site catchments (Fig. 10.1b). A distinct rise in other soils and other resources appears only in the Early Bronze Age soil barplot, signalling a shift of site location towards areas with greater soil diversity. At the same time, the pollen results from the Straldzha Mire (see Chapter 13) indicate a greater forest cover on the lowland plains during Neolithic to Early Bronze Age than today, which may have contributed to a greater extent of forest soils, since then washed away and replaced with fluvial and deluvial deposits.

10.3.4 The patterns of discovery

The absence of Neolithic to Bronze Age survey sites from the riverine zone or the hilly relief of the Sredna Gora are inconsistent with data from other survey projects in the Sredna Gora (Christov 2013, 561; Nehrizov *et al.* 2014, 645; Dumanov *et al.* 2016, 866; Leshtakov *et al.* 2016, 872). The existence of Neolithic, Late Chalcolithic, and Early Bronze Age sites elsewhere in the Sredna Gora underscore potential biases in the TRAP dataset, although detailed comparison is hindered by the lack of coverage and strategy reporting in the other surveys.

No prehistoric materials were found above the altitude of 500 m in either the Stara Planina or Sredna Gora. Zones above 500 m comprised ca. 4% of TRAP 2009–2011 survey coverage. If prehistoric sites were distributed randomly, we would expect to find less than one site (4% of 21 sites) here. Finding none is, therefore, consistent with expectations. No early remains were detected immediately at the foot of Stara Planina in the colluvial zone. While the stony soils may have deterred long-term settlement, complete absence of any signs of activity at the foot of the mountain points to burial by colluvium (*cf.* Chapter 7).

Below 500 m, most long-term settlements sat on the valley floor and old river terraces near mountain streams. Shorter-term occupations also sat on the valley floor and spread to river banks with time; a few Neolithic and Early Bronze Age sites occupied east facing, low terraces in the Sredna Gora (3053, 3055, 3059). Most of the flat Chalcolithic and Early Bronze Age concentrations appear in naturally eroded or artificially disturbed settings. These zones include the high northern banks of Koprinka and Sredna Gora slopes (1015, 2208, 3059, 3055, 3053, 4117, 4112, 4131), mountain stream gullies, or dams and artificial ponds. Some of the prehistoric material (4112, 4117, 4131) was in a secondary context, or in association with later material, which aided its detection (4152). Only a few concentrations (4113, 2045) comprised sherds on a flat surface without immediate visual clues of disturbance or erosion nearby. Three exceptions follow the 360 m contour north of the Tundzha River, which represents a zone where an earlier river terrace system meets with sediments brought by mountain streams. Given the erosional setting of the majority of non-tell sites, the valley bottom dataset, like most survey data, is the product of post-depositional processes (Ammerman and Shaffer 1981).

All in all, the earliest evidence for sedentary communities in Kazanlak occurs within 350–450 masl, with preference for deluvial soil. Active erosional surfaces in the valley provide windows into the past while depositional areas likely bury early materials (Ammerman and Shaffer 1981; Bintliff *et al.* 1999). The difficulty with materials exposed through natural and anthropogenic disturbance is that erosion and slope contribute to material dispersal, resorting and redeposition, complicating estimates of size, function, and character in the recovered assemblages. The combination of mechanical and chemical weathering accelerates the degradation of surface material, hindering its identification. Chapter 8 shows that 90% of the handmade pottery encountered in the field is worn beyond recognition. Likewise, total-pickup samples invariably yielded large amounts of unidentifiable sherds.

10.3.5 Prehistoric territories

With three sites in the study area, the Neolithic survey dataset is not very amenable to the assessment of intersite relations or spatial patterns (see yellow points in the digital figure).[4] If we assume contemporaneity and add other tells that are positioned between Kazanlak and Gabarevo (two in Pavel Banya, Gabarevo, Kran and Kazanlak; as per Mikov 1933b; Tabakova-Tsanova 1991), we end up with a dataset of eight potentially Neolithic sites, arranged in a linear fashion along the Tundzha River and its tributaries. Only the Kazanlak tell has been completely and systematically excavated (Leshtakov 2005), with others being partially (Nikolov *et al.* 2010) or only unsystematically explored. If we assume that contemporary layers existed within all of these tells and two Neolithic surface concentrations, we end up with eight sites in 200 sq km area. A territory of nearly 25 sq km would fall to each site, regardless of type. If we exclude flat concentrations (as associated activity areas), each tell would have a 33 sq km territory. For comparison, tells in the Nova Zagora region number 22 in an area of 350 sq km, or one per 16 sq km (Dennell and Webley 1975, 102–3). Nova Zagora has a density of tells twice that in the Kazanlak Valley. This does not necessarily mean fewer settlements in Kazanlak, it means fewer long-term settlements.

Short-term settlements (4131 or 3053) confirm that spaces between the tells were not as empty as one might assume if looking at the tells alone. If we applied the ratios

of flat to tell sites derived from the TRAP sample (2:1 for the Neolithic) to all the tells in the valley, we would arrive at some 16–24 of potential flat sites in the 200 sq km of the Kazanlak Valley. The mean of this estimate (one site per 10 sq km) would bring the Kazanlak Valley on a par with Nova Zagora.

In the Chalcolithic period the ratio of flat sites to tells is 3:2. An additional five tells sit outside the TRAP study area. In terms of spatial distribution, the five Chalcolithic sites known from the survey are aggregated in the middle of the study area close to the geographic centre of the Kazanlak Valley (and occur in clusters). This clustering may reflect preservation bias, or arise from a variety of processes such as settlement growth or colonisation of landscape by new communities that had split off the mother communities. The total extent of site territories and catchment areas changed little from the Neolithic.

In the Early Bronze Age the ratio of flat site to tells is 3:1 (if we include the early strata of 3055 dated to 2890–2620 BC by 14C). The site distribution map shows that most Early Bronze Age sites are concentrated in the northeast part of the valley with similar spacings between them.[5] Two exceptions (both concentrations) sit by the Koprinka Reservoir. With the assumption of contemporaneity, we can check the visible pattern with Nearest Neighbour analysis. The Nearest Neighbour analysis ratio of 0.746 indicates an aggregation of sites at the scale of the 200 sq km study area (Table 10.5). Aggregation usually has two possible explanations: (a) settlements are either competing for resources in the same environmental zone, or (b) settlements have friendly ties to mother communities and emerge in proximity to take advantage of familiar environments, nearby social networks, and availability of help (Earle 1976). The latter is likely occurring here. While eight of the sites share the same zone of deluvial soils for arable subsistence, few of them establish themselves as long-term settlements competing with their predecessors. The short-term character and proximity of the new sites to older habitation areas point to cooperative relations between the two groups.

A conclusion can be drawn that Early Bronze Age concentrations clustered within previously favoured environmental zones near established permanent sites, showing threads of continuity. Novelty is introduced through new foundations which disrupt this pattern and emerge further away from the existing cluster of sites on the valley floor, thus pushing the boundary of the settled zone of the Kazanlak Valley. The familiar deluvial soil zone of hoe farming is abandoned and instead the more diversified environs of the Tundzha River and Sredna Gora are taken up. Drivers behind this shift are likely diverse and beyond the scope of this section. The material remains suggest that the changes, however brought about, left the local population equipped with a palette of new subsistence strategies and new perceptions of what constitutes a desirable level of settlement permanence and visibility (Bailey 2000, 261).

10.3.6 Summary of the Neolithic to Early Bronze Age settlement patterns in the Kazanlak Valley

The confirmation of off-tell activity is the main contribution of TRAP surface survey to the prehistory of the Kazanlak Valley. While the ratio of site types suggests two to three shorter-term sites for each tell in the study area, it probably exceeded this number. Excavations have shown prehistoric layers at two sites out of three where no surface indication was present. Prehistoric layers appear at a depth of 0.6–0.8 m where there has been no exposure to the natural or anthropogenic processes that might bring materials to the surface.

Going by the visible surface record, site numbers grow through time, as does the overall area of use, which roughly doubles with each new phase (six Chalcolithic concentrations cover 2.81 ha, vs. 1.5 ha in the Neolithic). The aggregate site area, if it represents contemporary settlement extent, is very small for an 85 sq km survey area, and sites show lower density than in the Nova Zagora region on the other side of the Sredna Gora. More intensive survey focused on erosional zones and an expansion of site definition to single lithic artefacts would increase the number of prehistoric sites.

Neolithic communities show a preference for environments conducive to gardening agriculture and near forests and streams. Deluvial soils prevail in the catchments of all Neolithic, Chalcolithic, and Early Bronze Age sites. Only trace amounts of other soils, forest or riverine, appear in the prehistoric site catchments (Fig. 10.1b). A distinct rise in other soils and other resources appears only in the Early Bronze Age soil histogram, signalling a shift of site location towards areas with greater soil diversity. At the same time, the pollen results from the Straldzha Mire (see Chapter 13) indicate a greater forest cover on the lowland plains from the Neolithic to Middle Bronze Age than today, which may have contributed to a greater extent of forest soils, since then washed away and replaced with fluvial and deluvial deposits.

Despite growing site numbers through time, the surface evidence for Neolithic to the Early Bronze Age habitation or activity in the valley is rather poor, reaching the density of one site per 12 km at most. This is well below Northern European (Shennan 1985, 20, fig. 2.7) or Mediterranean standards during both site-based (Runnels and van Andel 1987, 309, Table 1) and siteless survey (Bintliff and Snodgrass 1988, fig. 2; Cherry 1983, fig. 1), or even the neighbouring region of Nova Zagora (Dennell and Webley 1975, 111).

The low site density, despite intensive survey, indicates that we are detecting a skewed fraction of the original record. This bias is unevenly distributed through the site

types: the long-term occupations left visually prominent traces and have likely been all accounted for. Shorter-lived occupations or activities which left only flat concentrations on the surface are possibly underestimated.

10.4 Late Bronze Age to Late Iron Age

This section includes the Late Bronze Age, Early Iron Age, and Late Iron Age periods. Although these periods span the threshold of prehistory and history from the perspective of a textual historian, they have been combined in one section because from the perspective of a landscape archaeologist, the respective datasets exhibit shared characteristics. Site distributions show trends consistent with small-scale communities undergoing major transformations. Sites grow in extent, feature a greater quantity and diversity of artefacts, and expand into new environmental niches, indicating communities that gradually cross the threshold towards more functionally differentiated and structurally complex society. These characteristics eventually culminate with the arrival of the Roman Empire.

The careful reader may notice that I skipped the Middle Bronze Age as it proved undetectable in TRAP survey area. Life probably did not come to a sudden halt between 2500–1600 BC, but settlement and subsistence patterns changed after the Early Bronze Age to such a degree that we could not identify them with the TRAP surface survey methods.

10.4.1 Change and continuity from the Late Bronze Age to Late Iron Age

The Late Bronze Age site distributions indicate a break with the Early Bronze Age settlement preferences. TRAP documented seven sites with Late Bronze Age materials in the Kazanlak Valley, all of which appear at new locations.[6] Early Bronze Age sites, both tell and flat settlements, were abandoned. Late Bronze Age sites, averaging one hectare each (Table 10.1), comprised concentrations of handmade sherds, lithics and daub, and indicated a preference for shorter-term occupations (hamlets and farmsteads). Temporal uncertainty affects two of the concentrations (3059 and 4113), which have only been broadly dated as ‘Bronze Age’, but whose material resists closer identification.

All of the certain Late Bronze Age sites also have an Early Iron Age component, suggesting continuity in Late Bronze Age locational preferences, and social and economic organisation. In total, Early Iron Age materials have been identified at 23 flat concentrations throughout the Kazanlak Valley, marking a fivefold increase in site count over the Late Bronze Age.[7] Of the 23 concentrations, however, three comprised marginal, low-density scatters with worn and indistinct materials, and one was a quarry site, whose chronological attribution remains uncertain. Eight sites yielded more than ten diagnostics, while at 11 sites fewer than ten diagnostics were documented.[8] The aggregate area of Early Iron Age concentrations was 21.5 ha, which is three times the Late Bronze Age extent (Table 10.1).

Only 14 of 23 Early Iron Age sites (61%) have Late Iron Age materials. Nearly 40% of Early Iron Age sites are abandoned, but the disappearing sites are short-term, interpreted as special-purpose sites, activity areas, or temporary shelters (*e.g.*, 1062, 2045, 3000, 3053, 4098, 4102, etc.). Well-established Early Iron Age settlements mostly remain in use and show signs of expansion (*e.g.*, 2031, 2036, 2046, 1033, 1008).

Some 24 new sites appear in the Late Iron Age, producing a total of 38, the highest site count of any period.[9] The aggregate area of these sites is 43.3 ha, averaging slightly over a hectare each (Table 10.1). Dewar’s model in Chapter 9 suggests that many (up to 65%) of the Late Iron Age sites may not be contemporary, however, and that the high raw count represents accumulation of short-term sites, resulting from frequent population movements. Likewise, although the total aggregate area of Late Iron Age sites is nearly double that of the Early Iron Age (43.3 vs. 21 ha), Dewar’s model indicates that the area occupied at any given time was also lower than the total aggregate area.

Dewar’s model is supported by evidence from the field. Ephemeral remains, characterised by the absence of construction materials and functionally narrow assemblages, provide an additional argument for the short-term nature of sites. So does the low density of surface material: only 11 of 38 sites produced more than ten diagnostics. The other 27 sites yielded only a couple of ceramic sherds each that can be coarsely assigned to the Late Iron Age.

10.4.2 Topography and environment

All of the certain Late Bronze Age concentrations (2031, 2032, 2198, 2208, 3055) form a line along the Tundzha River.[6] Four occupy the northern terrace of the Tundzha River and one (3055) sits on a terrace in the Sredna Gora next to a tributary stream, the Gyurlya. The two uncertain sites are in a deluvial soil zone in the middle of the valley (4113), and in forest soils on Sredna Gora terraces (3059). The aspect of most of the concentrations is south, southeast, and southwest. The Late Bronze Age sites enjoy a broad and balanced suite of soils, from the heavier riverine (alluvial) soils to forest and cinnamonic soils. Deluvial soil usage dropped dramatically while riverine soils became the dominant resource. All in all, the Late Bronze Age does not only see the abandonment of old sites, but also old environments and resources, signalling a major economic and social change.

The map of Early Iron Age distributions shows gradual infilling and colonisation of more varied environments throughout the Kazanlak landscape.[7] Human activity was concentrated in three areas: the valley floor (eight sites),

Tundzha River terraces (nine sites), and Sredna Gora terraces over the Tundzha River tributaries (three sites). A few sites newly appear in the northwestern part of the valley and Stara Planina slopes (1033 and 1062). The suite of soils available to the Early Iron Age communities in Figure 10.1b resemble the Late Bronze Age situation, except for the newly dominating deluvial and riverine soils.

As site numbers increase in the Late Iron Age, the infilling of the landscape continues everywhere except in the Sredna Gora proper.[9] The Sredna Gora zone shows a decline in site numbers, as 3059 and 4098 go out of use and are replaced by 4001 only. Activity around potential quarry sites (3057, 3058) is obscured by lack of data, but the popularity of ashlar tombs in the valley indicates that stone extraction continued, so these presumed quarries may still be in use.

Late Iron Age growth is intense north of the Sredna Gora. River terraces attract new activity (5006, 2206, 2198, 2073), but the biggest growth occurs on the deluvial soils on the valley floor (1044, 2044, 4122) and the foothills of the Stara Planina (3126, 3226, 3169 *etc*.). Completely new is a cluster of sites located in the northwest part of the valley near the extensive mound necropolis of Gorno Sahrane (see Chapter 8, Burial Mound section). Given the stony colluvial ground here, used today for pastures and lavender fields, these scatters may be associated with non-agricultural (non-arable) economic activities, ritual, and elite interactions (see more below).

In terms of environmental zone preferences, most Late Iron Age sites are located either on the valley bottom or on old river terraces. Large concentrations on the valley bottom, classified as settlements (2075, 4132, 4152), sit near both riverine and deluvial soils, suited for both hoe and ploughed agriculture, or animal husbandry. Other, smaller sites, classified as farmsteads, single structures, or activity areas (3169, 4106, 2019, 2199), are distributed across a greater variety of soils and environments, from alluvial meadows and swamps to alluvial sands and mountain slopes. Within these niches, the communities could engage in a range of subsistence practices, from fishing in the river and hunting and foraging in the forests to animal husbandry within the well-watered pastures surrounding the Tundzha River. The distribution of Late Iron Age sites across a great variety of soils suggests differentiated subsistence practice and (if representing contemporaneous sites) competitive exploitation of the available ecological niches.

10.4.3 Dispersal and aggregation from the Late Bronze Age through Late Iron Age

If the distribution of the Late Bronze Age sites at the scale of the valley is explored, schematically outlined as a rectangle of 200 sq km, the Nearest Neighbour ratio of 0.538 suggests that Late Bronze Age sites are fairly clustered (see Table 10.5). This outcome is consistent with a visual inspection of the map that shows sites arranged in a linear fashion along the river in the middle of the study area. Given the concentration within a single riverine zone, competition for the riverine resources is indicated. To test for competition, I sought evidence of dispersal at the level of riverine zone, which for our purposes translates into an intermediate scale of 1–3 km distance from any given site. In Ripley's K analysis, the observed Late Bronze Age values indicate that site dispersal begins above 1.5 km (see Fig. 10.3). This means that the Late Bronze Age sites appear clustered at the scale of the valley, but dispersed within their environmental zone. Dispersal within zone has been usually interpreted as competition for resources. Following this interpretation, the Late Bronze Age sites may be attracted to an unevenly distributed resource, namely the Tundzha River zone and derived resources, such as particular vegetation patches or animal habitats.

It is worthwhile to check for other economic and environmental factors leading to the Late Bronze Age concentration in the riverine zone. Avoidance of Early Bronze Age sites could be a social factor in the Late Bronze Age spatial arrangement. Wholesale abandonment of Early Bronze Age sites is curious, especially where Early Bronze Age settlements are located on the Tundzha River terrace, such as the concentration at 1015. Its topographic and environmental parameters fit beautifully those of new Late Bronze Age sites, but have not attracted a new settlement, pointing to social and ideational aspects of settlement placement in addition to the environmental ones. The total abandonment of Early Bronze Age sites, both inside and outside the riverine zone, suggests a complete break with the past.

In contrast to the Late Bronze Age aggregation, in the Early Iron Age the distribution map shows sites dispersed throughout the valley. The dispersal is confirmed by the Nearest Neighbour ratio which now exceeds 1 (R=1.053, as opposed to R= 0.53 during the Late Bronze Age, see Table 10.5), as well as Ripley's K, where the observed values stay close to the line expressing spatial homogeneity (see Fig. 10.3). These results suggest that sites within the valley (200 sq km) are at more regular distances from each other than if randomly located.

The Early Iron Age site dispersal may be a cumulative product of sequential colonisation of the landscape as settlements leapfrog through the valley over time. If it pertains to contemporary sites, the regular arrangement of sites can be interpreted as a product of two different socio-political scenarios: (1) maturation of individual daughter settlements into politically autonomous units, which keep their distance due to competition for resources, or through higher economic specialisation occupy new economic niches, or (2) a result of state planning and resettlement of population to ensure territories can support them (Earle 1976; 211–12). Given the lack of a potential regional centre, the settlement dispersal is most probably a result of the first scenario. As daughter settlements (2046, 2036, 2199, 4098) separate from the parent communities (2032,

4152, 2208, 3059, 3055), some remain within the same environmental zone and compete for the same resources. Others split off and occupy new ecological niches (4102, 1062, 1033) farther away, as growing specialisation allows them to subsist in more new environments. With increasing competition or increasing distance, the relationships between parent and daughter communities grow more tenuous, leading each community to develop its own identity and political independence. If they are contemporary, the regularly spaced Early Iron Age sites fit scenario one above.

In the Late Iron Age, Nearest Neighbour analysis of the broad dataset (ignoring contemporaneity problems) produced a ratio R=0.896, indicating a more aggregated site pattern than during the Early Iron Age (Table 10.5). This change is unsurprising given that site numbers grow by 40% and sites are constrained to the survey area of 86 sq km. Ripley's K analysis (see Fig. 10.3) shows the Late Iron Age sites tend to cluster at thresholds between 500 and 5,000 m. Clustering switches to dispersal above the 5 km threshold. The dispersal at 5 km is consistent with a grouping of sites within the valley into two distinct clusters: one northwest of and another east of the valley's geographic centre in the Koprinka Reservoir. The two clusters are separated by nearly 10 km (*e.g.*, Seuthopolis to 3126, or 3126 to 2031).

Within each of these clusters there are elite sites, characterised by the presence of high quality grey ware ceramics in residential contexts (Seuthopolis, 3126), or in special activity areas with few surface signs of architectural remains (2031, 1044, 2044, 2206). If we run the Nearest Neighbour analysis on these elite sites, we get ratios between 1.2 and 1.8. The lower ratio results if all sites are used where high quality grey ware was documented. If we use elite sites with architectural remains (Seuthopolis, 3126, 2031) the ratio increases to 1.8 (Table 10.5). Both ratios point to a dispersal of elite activities, which could be representative of 'antagonism' and would be expected of intensely competing independent political units, such as separate chiefly or religious centres (Pielou 1962; Earle 1976, 211). The evidence of spatial separation of elite activity and a 5 km radius ceiling on aggregation on sites throughout the valley points to the presence of autonomous communities with ca. 5 km radius territories.

This picture of social tensions and competition between sites, generated by geostatistical functions, is largely mechanical, and hinges on the condition of contemporaneity. It, therefore, provides a very coarse measure of a changing economic and political landscape in Kazanlak. This picture changes if we consider the results of Dewar's correction of the Late Iron Age dataset, which suggests that only 40% of Late Iron Age sites existed at any given time. If we assume that the 60% reduction affected all environmental zones proportionately, the corrected dataset might produce a Nearest Neighbour analysis ratio indicative of more uniformity, similar to the Early Iron Age period (which has 40% fewer sites). Since we cannot know which sites were contemporary, however, a more nuanced analysis requires excavation to clarify occupation spans, or more sophisticated stochastic modelling that can account for the spatial distribution of simultaneous sites.

Looking at the valley as a whole, changes begun during the Late Bronze Age echoed through the following millennium. Late Bronze Age sites competed for resources, dispersed within in the riverine zone, but aggregated at the level of the valley. With site proliferation during the Early Iron Age, sites dispersed through the valley, pushed apart either by antagonism or pulled by a desire for new resources. During the Late Iron Age, sites are more clustered, especially using thresholds up to a 5 km radius, suggesting some combination of the founding of satellite settlements from parent communities, exclusive catchments around settlements, and the shifting of settlements over time. In addition to expanding through all the environmental zones across the valley, individual sites produced more archaeological material, which yielded higher estimates of site size, beginning the long-term trend of site expansion (Fig. 10.1).

10.4.4 Site hierarchies and functional differentiation

When it comes to inter-site differences during the Late Bronze Age, two groups of sites emerge, differentiated by the condition of survival and quantity of surface materials. One group of concentrations features a full cross section of domestic and building materials (cookware, tableware, daub, lithics and storage pits), indicative of residential activities and interpreted as hamlets or villages. Examples of the first group are sites 2032, 3055, and 2208. In 2032 and 3055, the domestic purpose was confirmed upon excavation by small finds such as loom weights, spindle whorls, and lithic artefacts, as well as wattle and daub huts. The second group either comprises concentrations with (1) a narrow range of artefact types within an otherwise abundant concentration, interpreted as special purpose sites (2031), or (2) only a few characteristic Late Bronze Age sherds within a degraded concentration, interpreted – due to elusive function – as activity areas (*e.g.*, 2198). An example of a special purpose site is 2031, which contained no evidence of building materials, and a narrow range of cooking/serving wares (likewise 4113 and 3059 yielded no construction remains, but produced grinding stones, and evidence of food-processing activity). It appears to have served a more transient, perhaps ritual, purpose.

The two groups with distinct differences in sherd quantity and quality roughly map to different site size tiers. Villages or hamlets are medium sized >0.5 and <5 ha, while activity and special purpose areas tend to be in the sub-0.5 ha tier (Table 10.2, Fig. 10.2). The size ranges increase with time, mostly due to better survival, but possibly because of site growth. The growth need not indicate higher population levels. Test excavations at two

of the medium-sized Late Bronze Age and Early Iron Age sites showed that the hamlets comprise loosely distributed wattle and daub huts with hearths inside and storage pits outside (Nekhrizov and Tzvetkova 2010; Bozhinova 2010). This contrasts with the densely built spaces of prehistoric tells (where settlement growth could be taken as a proxy for population growth). Given the less compact living space, the Late Bronze Age villages were not the same as the villages on prehistoric settlement mounds, and likely housed fewer families, despite greater surface area (Bailey 2000). The aggregate area of Late Bronze Age settlements, likewise, increased only slightly from 5 ha to 6.6 ha during the Early Bronze Age, suggesting minimal population increase (if any at all).

In the Early Iron Age, the same site ranks as during the Late Bronze Age are encountered, but their aggregate area within rank increases threefold (Tables 10.2 and 10.3, Fig. 10.2). None of the concentrations featured any standing remains, and initial hints of functional differences (quarry vs. residential area) were not factored in the ranks. If the number and extent of sites within each rank are compared with their Late Bronze Age counterparts, the 'tiny' sites (<0.5 ha) increase in number from four to 12. Small-sized sites (<1 ha) increase in number from two to five, as well as in average site area (0.6–0.7 ha on average, see Table 10.4). Medium-sized (>1 and <5 ha) sites increase too (2.5–2.7 ha on average, Table 10.4). The increase in 'tiny' sites is rather strong and would be indicative of population dispersal if it represented new settlement foundations. These tiny sites, however, do not always represent habitations (2001, 2010, 2012), but rather special-purpose sites. The increase in average size in the medium rank of sites (from 2.51 ha in Late Bronze Age to 2.73 ha in Early Iron Age), most of which are interpreted as settlements (*e.g.*, 2032, 2208), provides a better support for a trend of moderate population growth.

As the Early Iron Age communities dispersed through the valley to exploit new resources, the surface remains became more differentiated. Residential, ritual and production activities are indicated at individual concentrations (3058 shows signs of quarrying; 2031 and 2001 suggest special purpose). Residential sites are common on the valley floor, and feature artefact groups typical for domestic activities of storage, food processing, and consumption. The considerable homogeneity between assemblages at residential sites suggests that most of the economic activity in the valley centred on subsistence. Besides the residential and productive activities, we have only sparse evidence for other aspects of human social life, such as ceremony or warfare. Special-purpose sites generally yield a limited number of finds, and appear in a marginal or special location. Finds of a few Late Bronze Age or Early Iron Age fragments near burial mounds (2001), or at prehistoric settlement mounds (Tabakova-Tsanova 1991, 106), point to potential ritual and feasting activities. Utilisation of elevated sites (1033, 3057, 3058) may relate to a particular resource exploitation, ceremony, or a defensive purpose. Most of the findspots in the Stara Planina contain few sherds, and may be labeled activity areas or seasonal shelters, but remain ambiguous. Given the poor agricultural potential of the forested slopes, it may be assumed that these elevated sites indicate individuals or communities specialising in anything from pastoralism, beekeeping, hunting, lumbering, to brigandage.

During the Late Iron Age, two sites (4132, 2075) newly occupy the large size tier (5–10 ha; see Table 10.2, Fig. 10.2). Tiny sites grow in number from 12 to 21 (75%), small sites grow from five to six (20%), and medium sites increase in number from six to nine (50%). If the estimates of the Late Iron Age extent of 2075 and 4132 are correct (both are multi-component concentrations), we could speak of initial settlement nucleation in the valley. Overall, the growth in higher size ranks is matched by growth in the small ranks, which points to overall settlement expansion. The network of Late Iron Age settlements inevitably grows denser, and more differentiated. The emergence of Seuthopolis in late fourth century BC marks the first urban settlement (Nankov 2008), endowing the remaining sites with the status of suburban or rural sites. Four sites featured traces of masonry, which we mostly interpreted as related to defensive or extractive (toll collection) purposes.

The survival of larger quantities of more differentiated material suggests more functional variety among the surface concentrations. Following the Early Iron Age pattern, we note residential, productive, and ritual use, as well as elite sites (residences or activity areas) with large quantities of high status pottery or imports (3126, 1044, 2044, 2031, 2032, 2206). Like the Early Iron Age sites, it is difficult to determine through survey whether all these types of sites were used simultaneously year-round, or sequentially on a seasonal basis. Site hierarchy interpretations here suffer from both contemporaneity problems and the potential that alternative (non-socio-political) mechanisms contributed to their formation. For example, iterative processes of population aggregation and fissioning driven by seasonal economic activities may combine to form a footprint of size hierarchy without necessarily expressing any political centralisation (Duffy 2015). Evidence from other sources is essential to link site-size hierarchies firmly to social and political hierarchy in the valley.

10.4.5 Summary of the Late Bronze to Late Iron Age settlement patterns in the Kazanlak Valley

In the Late Bronze Age, lifestyle preferences of the valley's residents transformed. Communities abandon the long-term settlements in the centre of the valley for the Tundzha River and other river banks and terraces. The drivers of this shift to river terraces (manifested through measurable settlement aggregation at the scale of the valley) remain unclear, with

external environmental pressure, technological change, or socio-cultural transformation being the main candidates. Competition for riverine resources and the avoidance of Early Bronze Age settlements signal a major shift in social and economic values and perceptions in the Late Bronze Age population in the valley. Despite questions around the causes of these changes, the Kazanlak situation is consistent with the Late Bronze Age findings elsewhere in Bulgaria (Leshtakov 2002, 167).

During the Early Iron Age, the previously vacated valley interior and Sredna Gora terraces fill up with new, small settlements. River terraces remain the focal points of vibrant settlement life, but new settlements appear in other ecological niches, pointing to the exploitation of new resources and new economic strategies.

Hamlets and villages of 1–5 ha size form the core of Early Iron Age settlement. As villages slowly grow, pressure is exerted on surrounding resources, a phenomenon that could have contributed to increased spatial dispersal of new habitation and activity areas.

In the Late Iron Age, the infilling of the landscape reaches its long-term maximum. Administrative differentiation accompanies site proliferation. The city of Seuthopolis heads the list as the first urbanised centre, which is flanked by a number of villages, forts, elite sites, and a multitude of new, ephemeral settlements, all indicating more intense activity in the countryside. While the increased frequency of community movement during the Late Iron Age dampened the intensity of settlement growth, the emergence of the first >5 ha sites, continued site differentiation, and evidence of resettlement and change, mark the Late Iron Age as a period of social and economic transformation.

10.5 The first millennium AD

10.5.1 Change and continuity from the Roman Period to the Early Byzantine Period

Twenty-six of the 38 Late Iron Age sites (ca. 70%) produced no Roman material, while 12 continue. Most of the abandoned sites appear to have been ephemeral, characterised by light artefact scatters, as discussed above.

In total, Roman material was identified at 23 concentrations, including four with *in situ* masonry (Fig. 10.1a).[10] Two of 23 contained mostly heavily worn pottery of uncertain date, 15 yielded less than 10 diagnostics, and eight scatters produced 10 or more diagnostics during a routine grab sample. Of the 23 sites, 13 had Late Iron Age antecedents (ca. 57%) while 10 were new (ca. 43%). Table 10.1 shows that although the total site count declines from the Late Iron Age maximum of 38, the aggregate site area during the Roman period rises to a long-term maximum of 54 ha. The average site size rises to 2.4 ha (double the Late Iron Age average), signalling site expansion and nucleation.

During Late Antiquity, 19 sites are in use in the Kazanlak survey area, continuing the decline in site count.[11] Discontinuity with the Roman period, moreover, is signalled by the abandonment of 13 Roman sites. Ten Roman sites continue (ca. 43%), while nine new sites emerge. Overall, Late Antique material is scarcer in the valley; four concentrations have 10 or more datable sherds while nine yielded only one or two diagnostics. Three sites contain some masonry. The aggregate site area drops from 54 ha during the Roman period to 31.2 ha during Late Antiquity, and the average site area drops from 2.4 to 1.6 ha (Table 10.1), reversing the growth seen during the Roman period. While the decline in site numbers is only 20%, aggregate site area drops by 42%.

Fifteen Early Byzantine sites were found, seven (47%) with Late Antique predecessors and eight newly founded (53%).[12] Only three findspots produced 10 or more diagnostics. Seven sites were associated with masonry (including legacy sites 4119 and 3133, which produced little or no diagnostic material during the TRAP campaign). Most sites were positioned at higher elevations. Altogether the Early Byzantine pottery concentrations and standing masonry cover an area of 24.5 ha (Table 10.1). Site count declines by 20%, accompanied by a similar decline in aggregate site area compared to the Late Antique period. The valley clearly suffers a decline in population and settlement after the Roman period that extended into the Byzantine era.

10.5.2 Topographic setting and soils

During the Roman period, the valley bottom is the most popular place for settlement. Over 70% of the land within 1 km of the Roman surface concentrations comprises light deluvial soils, further intensifying the trend that began during the Late Iron Age (see Fig. 10.1b). River terraces and slopes with alluvial and chernozem-like soils are second in popularity with 15% of the land within the 1 km buffer. Forest soils and heavy loams form the remaining 15%. Stara Planina spurs and Sredna Gora slopes decrease in popularity compared to the Late Iron Age, although these are not completely abandoned. The social and economic drivers seem to promote the settlement of well-drained, arable soils within the valley floor, bringing about an aggregation within this zone. The specific drivers (*e.g.*, preferential location close to Roman roads and markets) remain to be explored. Relaxation of former socio-political tensions and elite competition may play a role, as the section on Spatial Patterns will illustrate.

During Late Antiquity, the valley bottom remains the most popular place for settlement and human activity. Only two locations in the Stara Planina (1033, 4106) spurs are still occupied. The Sredna Gora do not show any signs of further use. In the valley, there are 10 sites within well-drained, deluvial soils and nine on river terraces and alluvial soils. Correspondingly, 52% of soils within

1 km of Late Antique sites are deluvial. This percentage has dropped considerably compared to the 70% of the Roman period, but still comprises the majority. Riverine and terrace soils take up 33% of soils within a 1 km radius of Late Antique sites, marking a growing popularity of heavy and well-watered soils. This could be motivated by social and economic changes in the valley.

The Early Byzantine sites in the Kazanlak study area are almost equally divided between the mountain slopes or foothills and the valley bottom. The vigorous colonisation of spurs and foothills of the Stara Planina represents the biggest shift in site distribution after Late Antiquity. Fortifications, representing either forts, guard towers, or enclosures, appear on the south facing slopes all along the northern boundary of the Kazanlak Valley. These can be found between 600–1100 masl in strategic positions near mountain passes and with a commanding view over the valley (from west to east: 3062, 3133, 1033). Such elevated sites are challenging to access, and easy to defend. Access to arable soils is limited, and they could not rely on arable agriculture for subsistence, unless embedded in a network of highly reliable supply channels from the valley (see reduction of alluvial meadow soils in Fig. 10.1b). Reliance on forest resources, pastoralism and its products, or on trade and tribute could have been the basis of subsistence strategies in these mountain communities. Sites in the foothills (4106, 1027, 2049) are near mountain resources and potential exit routes, but remain within easy reach of light arable soils, making the most of both ecological niches. The seven sites that remain on the valley floor (3122, 1008, 1056, 4132, 4152, 2045, 2044, 4116) occupy mostly well drained deluvial soils (Fig. 10.1b). River terraces and heavy, loamy soils have been abandoned, marking yet another point of discontinuity with Late Antiquity settlement preferences.

10.5.3 Spatial patterns and site hierarchies

The Roman period dataset, when subjected to Nearest Neighbour analysis, produces a ratio of 0.866. This number is slightly lower than Late Iron Age (0.896) and indicates more aggregation of sites at the regional level (see Table 10.5). Ripley's K analysis shows aggregation at the local level (up to a radius threshold of 1.5 km), regular arrangement at intermediate distances (1.5–6 km), and site dispersal at a regional scale of over 6 km (Fig. 10.3). The aggregation at shorter distances suggests that daughter sites or activity areas are established at immediate distances from parent settlements. Instead of multiple clusters within the valley that could represent different political factions, sites are now arranged at equal distances. The result is a very organised arrangement.

In contrast to the Late Iron Age, distances between large sites shrunk during the Roman period. Visual comparison of the Late Iron Age and Roman distribution maps finds Late Iron Age elite sites at different ends of study area, while Roman top-tier sites are huddled together in the middle of the valley. Nearest Neighbour analysis confirms the intuitive reading with a ratio of 0.849, which indicates that large sites are more aggregated than the rest of the dataset (Table 10.5). The dispersal of elite sites during the Late Iron Age is best explained through the rivalry of peer, politically autonomous, communities, with dispersal being the spatial signature of political factions operating within the valley, each guarding its resources. The aggregation of large sites during the Roman period, by contrast, marks the decline of chiefly competition and autonomy. The shrinkage of intersite distances implies a new supra-regional authority. What springs to mind is the newly introduced Roman rule, which suppressed old political factions, and contributed to the physical re-structuring of the valley's resident communities. After assimilation to the Roman social order, local communities would have lost some of their authority to regional and supra-regional centres (such as metropoleis of Colonia Traiana, Trimontium, *etc*). With authority removed, the footprint of chiefly competition would have gradually been replaced with patterns manifesting the new order. Unified legal and administrative frameworks, regulated access to resources, and transit organisation under Roman control, however imperfect, would have contributed to the clustering of large sites in easily accessible locations, such as we see in Kazanlak at this time. Creation of a normalised landscape with easily accessible sites can be one expression of state control (Scott 1998).

In addition to the contraction of distances between large sites, site extents grow. Table 10.2 and Figure 10.2 show that the decline in total site numbers during the Roman period affects the tiny (0.5 ha) site tier the most. Sub-hectare concentrations fall in number from 21 to nine (57%). A similar decline affects the middle rank of 1–5 ha sites. Conversely, the number of large sites doubles. Table 10.3 confirms that the large size rank now represents most of the occupied area in Kazanlak (34 out of 53 ha; 64% of aggregate site area). Altogether, Roman sites smaller than 5 ha occupy only 20 ha in total. By comparison, during the Late Iron Age the largest sites account for 14 ha (33% of aggregate 43 ha), while sites smaller than 5 ha represent 30 ha (67% of aggregate area). The growth of the highest tier of sites and decrease in the bottom tier during Roman times point to site nucleation and the movement of rural population into expanding settlements. Site growth suggests that population levels rise in Kazanlak. All in all, Roman period developments seem to attract people to large settlements, and compel settlements to cluster together more than had been the case in the previous periods. Obstacles to the aggregation of people and sites, such as a lack of resources or social friction, seem to have been overcome during this period.

In Late Antiquity, large Roman sites are abandoned and the remaining communities move further away from each other. This shift to greater inter-site distances contrasts with the aggregated arrangement of communities during

the Roman period. A Nearest Neighbour analysis ratio of 1.015 (after the Roman ratio of 0.688) quantifies the dispersal at the scale of the valley (Table 10.5). Below the scale of the valley, Ripley's K analysis reveals that sites within a 1,500 m moving window are slightly clustered, but afterwards their pattern is regular (up to 5,500 m) and consistent with Nearest Neighbour results (Fig. 10.3).

The dispersal of site distribution at multiple scales signals either an increase in insecurity, competition for resources, or antagonism between communities. Late Antique site decline accompanied by site dispersal suggests that the higher level of socio-political order, prosperity, and control witnessed in the Roman period had declined. Late Antique adjustment of site distribution is a response to a change in social and political circumstances. With the weakening of the centralised government, local communities are likely returning to a pre-Roman situation, where each community fended for itself. Insecurity and fear of neighbours drove communities apart, perhaps more so than the search for resources.

In addition to the spatial dispersal of Late Antique sites, sites shrink in size, and population levels in the valley decline. Table 10.2 shows that large sites decline in number from five to two, the medium rank remains unchanged (five sites), and the small site rank goes from four sites to one. The only category that grows during Late Antiquity is that of tiny sites (area <0.5 ha), whose number rises from nine to 11. Table 10.3 shows that only in the tiny and small site ranks do the average sizes increase (from 0.25 to 0.3 ha, and 0.75 to 0.83 ha, respectively, see Table 10.4). Communities seem to fission and settle into smaller settlements, with decline in aggregate area marking a population decline.

If the Late Antique site hierarchy is compared to the previous periods, a three-tier settlement system can still be detected (with sites at <0.5 ha, 0.5–5 ha, and >5 ha of size), whose foundation was laid during the Late Iron Age (Table 10.2). This hierarchy is, however, skeletal only, thinned of the population that lived in the valley both in the Late Iron Age and Roman period.

The distribution of Early Byzantine sites at the scale of the valley yields a Nearest Neighbour ratio of 1.104 (see Table 10.5). The result comes with a warning of statistical weakness due to a low z-score (in a sample of only 15 sites). This ratio confirms that the trend of Late Antique site dispersal continues. Communities drift further apart and their numbers decline, indicating that the drivers of dispersal, whether socio-political, economic, or environmental, are still in operation. Theoretically, we could test for pressure on environmental resources by checking for dispersal among sites in particular environmental zones. Such a test, however, requires a larger sample size, from which an environmentally classified subset could be extracted. Patterns below the level of the valley, at intermediate and short distances from sites, are consistent with those indicated by the Nearest Neighbour analysis. Ripley's K results show a slight aggregation of sites at 500 m radius. Beyond this immediate vicinity, the distances increase and at a 1500 m threshold the sites disperse (Fig. 10.3). Again, the sample is rather small and so these finer trends are not statistically significant.

Table 10.2 shows that the attrition of sites that started during Late Antiquity continues into the Early Byzantine period. Contrary to Late Antiquity, where the decline in the largest sites was partially compensated by an increase in tiny sites, signalling de-nucleation, the Early Byzantine period shows site loss across all tiers, signalling continued population decline. Only a single site of 6.7 ha remains in the large rank (Fig. 10.2). The medium and tiny ranks decrease in site count from five to four and from 11 to seven respectively. The small rank (0.5–1 ha sites) is the only one that goes up in number from one to three, perhaps representing the remnants of a larger community that split apart. Besides dispersal, Early Byzantine sites in Kazanlak exhibit environmental zoning.[12] The Early Byzantine sites only appear in two topographic zones, the mountain slopes and valley floor. The colluvial zone immediately under the Stara Planina is devoid of sites (3122 is the only exception). An uninhabited colluvial zone separates the mountain sites (forts and toll stations) from those on the valley floor. Sites follow at regular intervals (2 km) as if strung along a road in the deluvial soil zone near the centre of the valley. No sites were documented on the northern banks or terraces of the Tundzha River. After 2,000 years of human activity and settlement, the Tundzha River bank is now completely abandoned. The reasons for abandonment probably range from natural to cultural. Either the economic activities that occurred in this zone – water resource exploitation, water transport, animal husbandry, and commerce – are out of favour, or some topographic or environmental aspect of this zone (site intervisibility, proclivity to flooding, and so forth) caused the abandonment. Socio-political factors – such as the avoidance of the river due to a perceived threat, or the attraction of valley centre due to a new road system (Soustal 1991) – can play a role. Comparison with other regions and consultation of historical sources are necessary to explore the drivers of change in Early Byzantine site distribution.

10.5.4 Function and economy

Functional and economic differentiation reaches its apex in surface materials of Roman period sites. Evidence for specialisation becomes attenuated thanks to scarcer remains in the Late Antique and Early Byzantine periods, until we get a hiatus during the First Bulgarian Kingdom in Kazanlak.

Roman period surface assemblages show evidence of domestic activities, connection to trade networks and crafts or industries. Residential sites exhibit a cross-section of cooking, tableware, and storage ware, with an occasional fragment of amphora, water pipe, and imported

pottery, embedded among a scatter of bricks and tiles. The assemblages show that more effort was invested into permanent architecture, and that households now have a wider repertoire of vessels at their disposal. The presence of imports and imitations, Roman coins (1013), and transport vessels, points to reliance on markets and exchange for non-local products. Slag and wasters as well as other evidence of metals (2046, 2044 – chariot wheel) indicate that industrial activities took place at some of the farmsteads and hamlets, in addition to core subsistence. Standing masonry at a single valley floor site (3227) indicates both its greater longevity and administrative status, while epigraphic monuments found through excavation indicate the ceremonial character of a series of sites in the valley (4123, 4102?, 3000). These finds help us differentiate between ritual and domestic sites. The quantities of industrial remains were low and always associated with residential remains, which speaks for small-scale industrial production, rather than a thoroughgoing specialisation without any subsistence activities. Physical location provides additional evidence for functional site differentiation. Sites 4001, 1033, and 1027 are located in elevated positions that offer strategic advantage, but do not support agriculture. Masonry features show that these sites may have been used as guard posts.

While site sizes fall into only three tiers, five functional groups are attested among Roman surface distributions: agricultural settlements on the valley floor featuring some industry and imported wares (2046, 2036, 2075, one a veteran colony 4116), guard towers on the mountain spurs (4001, 1033, 1027, *etc*.), one administrative centre (3227) and several religious centres (4123, 2044) on the valley floor. Other ephemeral activity areas or special purpose sites (ritual or feasting) are attested (2010, 1008, 1056, and 4121).

During Late Antiquity, the sites exhibit similar functional variation as during the Roman period despite the reduced site numbers, attenuated large rank, and overall spatial dispersal. Two defensive sites remain in the mountains (1027, 3062, and 4106). Residences (farms and hamlets) feature on the valley bottom (1006, 2036, 2046, and 2075); administrative, military, and religious centres persist (3227, 4116, 4119 – excavated basilica, 2044 – Thracian Horseman sanctuary), as do ephemeral scatters (2001, 1049, etc.). Standing masonry is more frequent at Late Antique sites (five out of 19, or 25%, as opposed to three of 23 in the Roman period). The uniform spatial distribution of Late Antique sites indicates hostility and competition, if it reflects political relations. Since the elevated locations need economic support, some of the sites may be functionally complementary (Crumley 1979; Crumley *et al.* 1995). The ceiling on site sizes and the relative frequency of defensive masonry suggest a collection of politically autonomous or externally threatened communities.

In the Early Byzantine period, functional differentiation becomes more ambiguous due to extremely low densities of artefacts at surface concentrations (only the forts at 1033 and 4106 have more than 10 sherds). Given the scarcity of material, topographic location, architectural remains, and excavation reports become the main evidence for site function. Six elevated sites in the Stara Planina now contain the remains of masonry and vary in function from defensive walls, boundary walls, and enclosures (3062, 3133) to guard outposts and hilltop towers (1033, 4106 and 1027, 2049). The nine concentrations on the valley bottom point to either domestic or productive activities (3122, 1008, 4132, 4152, 2046, etc.). Religious and ritual sites are defined by a narrow assemblage of finds or legacy excavations (1056, and 4119; Tabakova-Tsanova 1991, 112). Low-density scatters interpreted as activity areas grow scarce (1008, 4116). Larger concentrations might merit the label of hamlets, while the smaller ones probably comprised a few standing structures, such as a house and an associated shed or workshop. The increased frequency of fortified and hard-to-access, small-scale sites with good visual control over the valley point to the preference for marginal yet safe environments. The remaining sites in the agricultural valley bottom point to continuity. Dewar's corrections suggest that only 50% of these sites existed simultaneously, but given the chronological coarseness we cannot tell if the sequence went from valley floor to the mountain spurs or vice versa, or if the two groups coexisted but in smaller numbers.

10.5.5 Summary of the first millennium AD settlement patterns in the Kazanlak Valley

For the next 1,000 years after the Late Iron Age, the Kazanlak Valley is marked by a decline in site numbers. During the Roman period, the drop in site numbers is balanced by site growth and nucleation, indicative of expanding population and overall stability and prosperity in the valley. Roman period communities are more sedentary than their Late Iron Age predecessors, and their spatial arrangement, characterised by aggregation, suggests external authority. As the population of the valley flows into expanding nucleated settlements, isolated life in far-flung small settlements becomes rare. During the Late Antique and Early Byzantine periods, decreasing site numbers and aggregate area are accompanied by site dispersal, indicating population decline and the return of inter-site competition and even antagonism.

The trends accompanying the decrease in site count during the first millennium AD echo through the varied locational preferences of the valley's communities. The Roman-period preference for deluvial soils on the valley floor contrasts sharply with the colonisation of all available ecological niches during the preceding Late Iron Age. Late Antique communities occupy a more balanced suite of environments, returning to the riverbanks and abandoning some valley floor sites. During the Early Byzantine period, the Stara Planina spurs and the valley

bottom are favoured for settlement, while riverine zone is left empty. Whether these locational swings represent functional adaptations of resident communities to new socio-political circumstances in the valley, responses to environmental stimuli, or economic changes remains to be explored.

10.6 The Mediaeval and Ottoman periods

The Mediaeval and Ottoman periods are under-represented in the Kazanlak survey dataset. While the pottery is relatively easy to spot and identify, and is often accompanied by architectural material, the Mediaeval and Ottoman remains are most likely to be buried under the modern villages and towns in the Kazanlak Valley, and thus remain inaccessible to archaeological investigation. The Ottoman period material, furthermore, suffered from observer bias, especially in the early seasons of fieldwork. Being considered 'virtually modern' it hovered uncomfortably on the margins of the 'archaeological' aims of TRAP. On its own, the Ottoman material was highly visible and abundant (4115, cemetery next to 2031), ranging from glazed colourful sherds to fragments of blue glass bracelets. Despite high visibility and good preservation, however, Ottoman material was not easily distinguishable from 'modern' pottery (a category intended for twentieth century remains). Some Ottoman remains, therefore, may be hiding under the 'modern' counts in TRAP field documentation. With no Mediaeval or Ottoman specialist on the field team (museum staff helped with identification at the base), Mediaeval or Ottoman components or sites were not followed up with the same rigour as other, earlier components (*e.g.*, no total pickups were conducted at Mediaeval or Ottoman sites). The distribution maps of Ottoman remains, in particular, should be consulted with an eye to modern villages and the hotspots of 'modern' artefact concentrations, which might conceal Ottoman materials. Only in later seasons, as the awareness of the significance of the Ottoman remains increased, did the Ottoman material receive attention equal to the earlier periods.

10.6.1 Continuity and change during the Mediaeval and Ottoman periods

In the Mediaeval period, which sees continual conflict between the Byzantines and the Bulgarian Kingdom, the Kazanlak distribution map shows a notable revival of activity.[13] Mediaeval materials were documented at 21 concentrations, covering a total of 30.7 ha (Table 10.1). Site numbers increase by six from the Early Byzantine period and nearly reach levels of the Roman period. The aggregate site area matches the Late Antique threshold. In terms of site continuity, only three of 15 (20%) Early Byzantine locations continue to be used during the Mediaeval period, including two elevated (1027, 1033) and one valley bottom (2036) site. In many cases, the 'new' settlements are not exactly new foundations; Mediaeval communities return to old Roman or Late Antique site locations, divorcing the Early Byzantine era.

Overall, the archaeological footprint of human activity becomes more pronounced after the relative scarcity of material in the Late Antique and Early Byzantine periods. More numerous and more characteristic material appears. Seven sites (30% of total) have more than 10 diagnostics. Nine sites produced only one diagnostic sherd each.

Ottoman period material was registered at 15 sites, 30% fewer than the Mediaeval period.[14] Despite the drop in site count, the aggregate area of the 15 findspots and their standing remains comprises nearly 95 ha, signalling a threefold increase over the Mediaeval period (Table 10.1). The remains of Hamidlu (3231), an Ottoman village in the northwest part of the valley, contribute to the increase in area of the Ottoman component. Nine out of 15 Ottoman sites (60%) have Mediaeval predecessors. Ottoman materials appeared in relatively small quantities at sites without masonry. Sparse Ottoman finds at earlier sites were interpreted as casual visits, or the remains of ephemeral activities in the landscape (dumping, manuring, infrastructure building), rather than permanent occupation.

10.6.2 Topographic setting and soils

Site location preferences in the Mediaeval era partially return to the Late Antique or Late Iron Age model, with proportionate site distribution across ecological zones. Seven sites sit on the valley floor, seven on the banks of the River Tundzha (now Koprinka Reservoir), and six in strategic locations in the surrounding mountain slopes. The soils available to the valley bottom sites show a balance between deluvial (47%), and riverine soils (44%), with forest soils (9%) accounting for the remainder (Fig. 10.1b).

Riverbanks or, specifically, the north banks of the Tundzha River, become the most popular place to settle again, after a hiatus during the Byzantine period. The northeast part of the valley is second in popularity, with a cluster of defensive sites. Forts at the mountain pass above the town of Kran create a chokepoint for the extraction of tolls. The remaining settlements in the valley are dispersed over the light deluvial soil zone in the middle of the valley. The Sredna Gora are empty with the exception of one hilltop site (4001).

The majority of Ottoman sites (seven) concentrate within the light arable soils of the valley floor. Two sites sit on Stara Planina spurs (3362, 3169), two within the colluvial deposit below (4115, 3231). Four occupy the north bank of the Tundzha River (1006, 2019, 2001, 2031), and one sits in the Gyurlya Valley in the Sredna Gora (4098). The largest (top-tier) sites appear at the foot of Stara Planina (3132, 4115), showing a trend of site growth along the northern edge of the valley, perhaps in response to an existing road and mountain pass network. The popularity of the Tundzha River banks declines compared with

Mediaeval times. Soils accessible from Ottoman sites are dominated by deluvial sandy (51%), followed by heavy riverine (24%), and leached forest (13%) soils, similar to Late Antique and Roman periods (Fig. 10.1b).

10.6.3 Spatial patterns and site hierarchies

The distribution of Mediaeval sites, when assessed via the Nearest Neighbour analysis, yields a ratio of R=1.053, which is random (neither clustered nor dispersed, see Table 10.5). Looking at local and intermediate scales, Ripley's K analysis shows a strong clustering of sites up to 1,500 m radius, mild clustering between 1,500 and 3,500 m radius, a dispersal past a 3,500 m threshold (Fig. 10.3). The clustering at the local level is consistent with a group of sites observed north of Kran and Enina, and a second group around the Koprinka Reservoir. The count of sites in each tier grows for the first time since the Roman period (Table 10.2). The tiny site rank increases by four (from seven to 11), the large site rank increases by one, and we get the first extra-large site that exceeds 10 ha (4115). The growth in the upper tiers is indicative of population nucleation and economic growth within the valley (Table 10.3). Average site sizes, however, drop in the three lower ranks, indicating population movement from small to large sites (Table 10.4). Aggregate area increases, implying moderate population growth, but tier composition may be explained by movement rather than growth.

The unexamined element in this discussion of the Kazanlak Valley in the Mediaeval period is the unnamed successor of Seuthopolis. A layer of Mediaeval structures filled with agricultural implements, animal bones, and some 800 coins was excavated during rescue works in 1950s. Dated from the eleventh to the fourteenth century AD, it sat on top of the Thracian city (Changova 1972, 16). As its name remains unknown, I refer to it as 'Mediaeval Seuthopolis'.[15] The addition of Mediaeval Seuthopolis to the group of sites on the banks of the Koprinka Reservoir underscores the desirability of the river as a settlement zone. Mediaeval Seuthopolis with its necropolis covered an area of some 4.5 ha and was the largest site in the southern half of the valley. The existence of the Mediaeval town of Kran (4115) to the northeast points to possible rivalry between these two large sites and their satellite communities. Complicating the picture, the appearance of the third large site (4132) could have implications for local authority and political relations. Interpretation of this site is difficult because it consists of several components, lacks fortifications, and generally has an ambiguous function.

The Nearest Neighbour analysis for the Ottoman period yields a ratio of R=0.844, indicating slight aggregation at the level of the valley, remarkably reminiscent of the Roman period (Table 10.5). Ripley's K analysis indicates that sites cluster up to a radius of 3,000 m, and gradually disperse beyond this threshold (Fig. 10.3). In terms of site hierarchy, the top tier of sites sees a major boost with the addition of 3231, an Ottoman village in the northwest of the valley. Table 10.2 shows that small and tiny tiers have shrunk to half their Mediaeval numbers, a trend that points to population nucleation in the large centres. Looking at the map of site distributions, we can see that several of the large Ottoman concentrations have a tiny neighbour in the vicinity (*e.g.*, 4115 and 3362, 3231 and 3169, 2046 and 2044), and another mid-tier neighbour within 2–3 km. The impression from the map is of regular distribution of sites through the valley. Furthermore, there is little to no clustering apparent within the environmental zones of the valley; sites are distributed evenly along the river banks, deluvial soil zone, and mountains. The largest sites (4115 and 3231) are positioned in the northeast and northwest parts of the valley, respectively. The location in opposite corners of the valley might indicate some local competition, or, have an economic basis, such as *e.g.* controlling lines of communication or productive zones.

Overall, the regular site distribution could result from incorporation into the Ottoman Empire (Inalchik 1994). The resemblance between the Roman and Ottoman period maps is striking. The economically significant production of rose oil has its roots in the Ottoman markets, as does large-scale wool production and long-distance transhumant pastoralism. The extent of Ottoman power in the valley is, however, beyond the scope of the current study.

10.6.4 Function and economy

Mediaeval site dispersal on the valley floor and river banks suggests arable agriculture and animal husbandry as the main sources of subsistence. Agricultural and viticulture tools, and a variety or horse and cow shoes found at Mediaeval Seuthopolis, bolster the picture of diversified farming, fruit growing, and stock raising (*cf.* Changova 1972). The proximity to river and mountain resources in two-thirds of sites underscores the ability of residents to engage in hunting, fishing, lumbering, and other economic activities.

The zonal distribution and nature of surface remains point to economic differentiation and complementarity in Mediaeval site groups. Sites in the mountain passes provide protection, offer access to forest resources, and have the potential for toll collection. Sites on the valley bottom offer products of arable agriculture and crafts, while sites centred on the Tundzha River provided access to downstream trading routes and pastures for stock raising. Given the specific resources available to each group, the communities within the valley were likely engaged in a network of exchange.

The environmental and topographic zoning of sites is not as accentuated during the Ottoman period as it was during the Mediaeval period. As in the Roman period, many of the mountain forts are abandoned in favour of life in the valley bottom; only two forts survive. Large sites occupy both the geographic centre of the valley and the colluvial fans at the foot of the Stara Planina, suggesting an emphasis on agricultural and pastoral production. The growth of

sites along the northern rim of the valley indicates either a strong preference for local colluvial fields (plantations of perennials, such as roses and lavender, or meadows for stock raising) or an orientation towards existing lines of communication. A number of new industries are known to intensify during the Ottoman period, including rose growing and wool production based on long-distance transhumant pastoralism. The number of enclosures associated with Hamidlu imply animal husbandry as part of local economy. Mediaeval Kran (4115) and its associated fortress guard the entrance to a pass and perhaps collected tolls (Popov 1982). More information is needed about the banks of the Tundzha to determine if the river is being used primarily as a transport route, source of tolls, or merely as a natural resource for fishing or stock raising. Despite low site numbers, the nature of Ottoman surface residues and their large spatial extent point to functional differentiation and prosperity, as well as interaction and cooperation, with roots in the Mediaeval period and full development under the auspices of the Ottoman Empire.

10.6.5 Summary of Mediaeval and Ottoman settlement patterns in the Kazanlak Valley

The Mediaeval and Ottoman periods mark the revival of the Kazanlak Valley after the hiatus of the Early Byzantine period and the First Bulgarian Kingdom. Increasing site count and aggregate area in the Mediaeval period point to population growth. We expect most Ottoman remains to be masked by modern urbanism, yet we see a larger inhabited area during this era. Sites in both periods exhibit environmental zoning characteristic of functional differentiation. The settlement pattern in the Kazanlak Valley is compatible with incorporation into the Ottoman Empire.

10.7 Discussion

The diachronic distributions of sites in Kazanlak are affected by natural as well as cultural factors. The salience of these factors varies from period to period and is in part the product of the analytical approaches applied. The evaluation of environmental resources and the statistical assessment of site clustering place natural and socio-political factors in focus respectively. Especially after the Early Iron Age, linking site hierarchies to political centralisation may mask alternative processes behind the settlement patterns. The emphasis here has been to use these frameworks critically, and characterise rather than explain the observed settlement patterns, mapping human interaction with natural and social environments over time.

Environmental variation is encapsulated by the following trends: A Late Bronze Age focus on the riverine zone; Early Iron Age expansion into all ecological niches; Roman focus on the valley bottom; and Early Byzantine division between the valley and mountain zone. These ecological preferences are associated with a multitude of site distribution patterns that can be variously attributed to socio-cultural and political phenomena, or to economic and environmental preferences. Site distribution patterns, characterised by aggregation, regularity, or dispersal, produce different results at different scales, site tiers, and environmental zones. At the scale of the valley, the four periods above are characterised, in turn, by site aggregation (Late Bronze Age), dispersal (Early Iron Age), aggregation (Roman), and dispersal (Early Byzantine). Below the scale of the valley, dispersal and aggregation vary by specific environmental zone or site tier. Dispersal governs site arrangement in the riverine zone during the Late Bronze Age, indicative of competition for river resources. Dispersal also characterises elite site distribution during the Late Iron Age, pointing to elite competition at a subregional level. Aggregation in both large sites and all sites in the valley bottom characterises the Roman and the Ottoman periods, suggesting a relaxation of local elite competition. The multiscalar trends cumulatively reflect an interplay of changing economic, social, and political factors operating in the Kazanlak Valley.

The timing and source of this spatial variation is hard to understand from the survey data alone. Not all variation can be explained in terms of environmental preferences or economic changes alone. The shift of Late Bronze Age communities towards the river appears to be driven by environmental considerations and economic preference, but that may be due to the very narrow range of variables considered here. The pattern could result from post-depositional processes, particularly burial, which has been flagged as a major source of bias in the prehistoric component in the valley.

Relating spatial trends in survey data to specific social phenomena has its limitations. Namely, the patterns in survey data do not align well with the fine-grained historical sources that exist for the valley from the Late Iron Age on. The coarse scale of survey data is difficult to reconcile with the chronologically discrete (even if discontinuous) historical events and evidence from excavations.

Other phenomena, such as site continuity, also operate across different dimensions, from site tiers to environmental zones, and pose a challenge for interpretation. Roman-period decrease in site count must be coupled with site area and spatial arrangement. Time lag poses another challenge to interpreting the static surface record. Mediaeval-period remains offer a palimpsest of local competition with an emerging single centre, which cannot be disentangled without chronologically bound evidence from excavations or historical sources. Likewise, discontinuity that we see during the Late Bronze Age probably occurred earlier. Not all processes happening over the long term are equally represented in the archaeologically visible record. Interpretation of Middle Bronze Age transformations or Mediaeval sociopolitical organisation is limited by the lack

of diagnostics, poor preservation, and low chronological resolution of survey materials.

10.8 Conclusion

Major trends in the Kazanlak survey data may be summarised as:

- The Neolithic to Early Bronze Age communities in Kazanlak lie dispersed across the landscape, enjoying larger territories and lighter soils than their counterparts in the Maritsa Valley.
- Changes occur in the settlement pattern after the Early Bronze Age and become manifest in the Late Bronze Age, when a wholesale abandonment affects old settlements.
- Residents turn to river banks after the previous colonisation of the valley bottom. The restructured settlement system proliferates and expands into new ecological niches during the Early Iron Age.
- Differentiation in terms of site location and function reaches an apex during the Late Iron Age. All Late Bronze Age sites are reused during the Early Iron Age, and two-thirds of Early Iron Age sites survive into the Late Iron Age. This variation in environmental setting, coupled with site dispersal, implies a more complex political and economic organisation among the resident groups.

The settlement of both fertile and marginal lands during the Late Iron Age points to a wide range of subsistence practices in the valley, with potential for exchange between local communities. The number of sites drops during the Roman period. Only 30% of Late Iron Age sites are reused, but those that survive increase in size, marking a period of population growth and nucleation. While population grows, sites are concentrated in a single ecological niche on the valley floor, having abandoned more marginal environments. Economic differentiation, previously fuelled by residence in different environmental niches, now either abates or becomes less visible. Products of new crafts and services (*e.g.*, production of stone inscriptions, metal, architectural ceramics, and local wheel-made pottery) circulate within the clustered sites on the valley bottom, and non-local goods are transported here via trade networks linking the Kazanlak Valley to other parts of Thrace. The aggregation of settlements after previous dispersal points to new political and economic organisation that promoted site growth, clustering, and easy accessibility.

Roman-era stability and prosperity ends during Late Antiquity when site numbers decline and growing inter-site distances signal renewed tension. The Early Byzantine period sees a precipitous population decline with the lowest long-term site numbers. After a 75% site number decrease during Late Antiquity and an additional 50% decrease in the Early Byzantine period, little remains of the Roman fluorescence. The remaining communities scatter and disperse within two topographic zones: the valley bottom and the Stara Planina spurs. The riverside is virtually depopulated. The increased frequency of fortified and hard-to-access, small-scale sites with a good visual control over the valley points to the preference for marginal yet safe environments. The sites remaining on the agricultural valley bottom indicate continuity. The new spatial pattern, nonetheless, points to new socio-political circumstances in the valley, new antagonism and mistrust, which restructure both the priorities and economic practices of the surviving population. These two groups, one in the valley and one in the mountains, could represent new political entities that established separate spheres of influence and exploitation while sharing the same valley.

This Early Byzantine trend of separation is overcome during the Mediaeval period, when local communities grow in number, occupy three environmental zones, and start to prosper. The renewed emphasis on river and mountain resources marks both the exploitation of all available environmental zones, as well as the extraction of additional revenue from trade routes and mountain passes. The Ottoman period marks a return to Roman-like prosperity. Site numbers decrease, and the settlement zones become restricted again, but sites grow, functional differentiation increases, and sites cluster. The Kazanlak Valley sees greater political stability, signalled by several large communities sharing the valley.

The diachronic variation in site distributions in the Kazanlak Valley shows that settlement patterns changed from one period to the next (and probably at a finer chronological scale too) in response to changing locational preferences and socio-political realities. The alternating patterns of site aggregation and dispersal from the first millennium BC on seem to be related to the political situation, such that aggregation appears in the valley in response to external political control over it, while dispersal marks local autonomy and competition (like the 'colonial model' of Cherry 1982, 328). Below the scale of the valley, other patterns operate across environmental zones and site tiers. The general patterns at the level of the valley relate to long chronological periods dictated by poor chronology of survey data and provide only a coarse indication of long-term processes. I hope that this chapter will stimulate a finer-grained historical analysis of the Kazanlak Valley, as well as archaeological comparisons with other regional and national datasets.

Notes

1 Kazanlak site catalogue – DOI: https://doi.org/10.6078/M7MW2F76

2 Map of Neolithic and Chalcolithic sites – DOI:https://doi.org/10.6078/M7NZ85QF; Late Bronze Age through Roman sites – DOI: https://doi.org/10.6078/M7513W96

3 Kazanlak site table – DOI: https://doi.org/10.6078/M73T9F9D
4 Distribution of Neolithic and Chalcolithic sites in the Kazanlak study area – DOI:https://doi.org/10.6078/M7NZ85QF
5 Distribution of Early Bronze Age sites in the Kazanlak study area – DOI: https://doi.org/10.6078/M7DJ5CP1
6 Distribution of Late Bronze Age sites in the Kazanlak study area – DOI:https://doi.org/10.6078/M71834KV
7 Distribution of Early Iron Age sites in the Kazanlak study area – DOI:https://doi.org/10.6078/M7WH2N24
8 Late Bronze Age through Roman distributions in the Kazanlak study area with histograms of diagnostic sherds – DOI:https://doi.org/10.6078/M7513W96
9 Distribution of Late Iron Age sites in the Kazanlak study area – DOI: https://doi.org/10.6078/M7RR1W9Z
10 Distribution of Roman period sites in the Kazanlak study area – DOI: https://doi.org/10.6078/M7N014MC
11 Distribution of Late Antique sites in the Kazanlak study area – DOI: https://doi.org/10.6078/M7H9938C
12 Distribution of Early Byzantine sites in the Kazanlak study area – DOI:https://doi.org/10.6078/M7CJ8BK3
13 Distribution of Mediaeval sites in the Kazanlak study area – DOI:https://doi.org/10.6078/M77S7KVC
14 Distribution of Ottoman sites in the Kazanlak study area – DOI:https://doi.org/10.6078/M7416V4C
15 The site is indicated with grey symbol in the Koprinka Reservoir in DOI: https://doi.org/10.6078/M77S7KVC

PART III
Yambol Study Areas

11

Yambol: topography and environment

Adela Sobotkova and Shawn Ross

Abstract *This chapter introduces the topography, climate, environment, and demographic circumstances of the Yambol province in southeast Bulgaria. It then focuses on the two Tundzha Regional Archaeology Project (TRAP) study areas there. The Yambol province is characterised by the alluvial deposits of the Middle Tundzha River catchment, which offer accessible, fertile, and well-watered soils for agriculture. Prominent rock outcrops punctuate the otherwise flat to rolling landscape, offering stone resources and defensible locations. The population of the region is concentrated in Yambol city, the regional capital, with the rest dispersed in villages and rural settlements across the Thracian Plain.*

Keywords *Yambol; Elhovo; Dodoparon; Middle Tundzha River catchment; climate; environment; demography*

11.1 Introduction

This chapter discusses the topographic, environmental, and demographic makeup of the Yambol province in southeast Bulgaria and two study areas of the Tundzha Regional Archaeology Project (TRAP) within it. The Yambol province is largely an agricultural region, located between the busy coast of the Black Sea to the east, and the major transit corridor connecting Bulgaria with Turkey and Greece in the Haskovo region to the west. As a result, the province feels slow and unrushed, and is a good example of a rural hinterland of Bulgaria. The plains of Yambol have expansive sunflower and grain fields, fish ponds, irrigation canals and water towers, and vineyards on occasional hills. At the time of survey, tractors and donkeys work side-by-side to plough agricultural fields. The gentle landscapes of the Thracian Plain offer a dramatic contrast with the visually stunning mountains towering above the narrow Kazanlak Valley. The quietude of the region also contrasts with the active tourist and cultural activities common in Kazanak and its environs. One rarely sees a tour bus in Yambol. The region went through an economic depression in the 1990s which depopulated many villages. Life started returning to Yambol province in the 2000s, first with new shopping markets and pubs, later with new quarrying industry and modern farming equipment, and finally with large infrastructure projects such as the Thrakia Highway and regional road works. TRAP field campaigns were relaxed in Yambol thanks to its slower pace and warm sunny weather, as well as engaged and friendly staff at the Yambol History Museum. We were not surprised when during the campaigns of 2008–2010 we started meeting seniors from the UK who have chosen Yambol province for their retirement because of its low cost, low-key lifestyle, friendly residents, and pleasantly warm climate.

11.2 Topography

The Yambol province lies in southeast Bulgaria, within the catchment of the Middle Tundzha River (Figs. 11.1 and 11.2). It encompasses a territory of 3,355.5 sq km and borders the province of Sliven in the north, Stara Zagora in the northwest, Haskovo to the west, Burgas to the East, and the Republic of Turkey to the south.

In the north, the Yambol province contains a small section of the Stara Planina near Lozenets. South of the Stara Planina, the Thracian Plain begins. Near the village of Straldzha, and just under the Stara Planina, lie the remnants of a large inland lake, where surviving wetlands provided an important palaeoecological sampling site

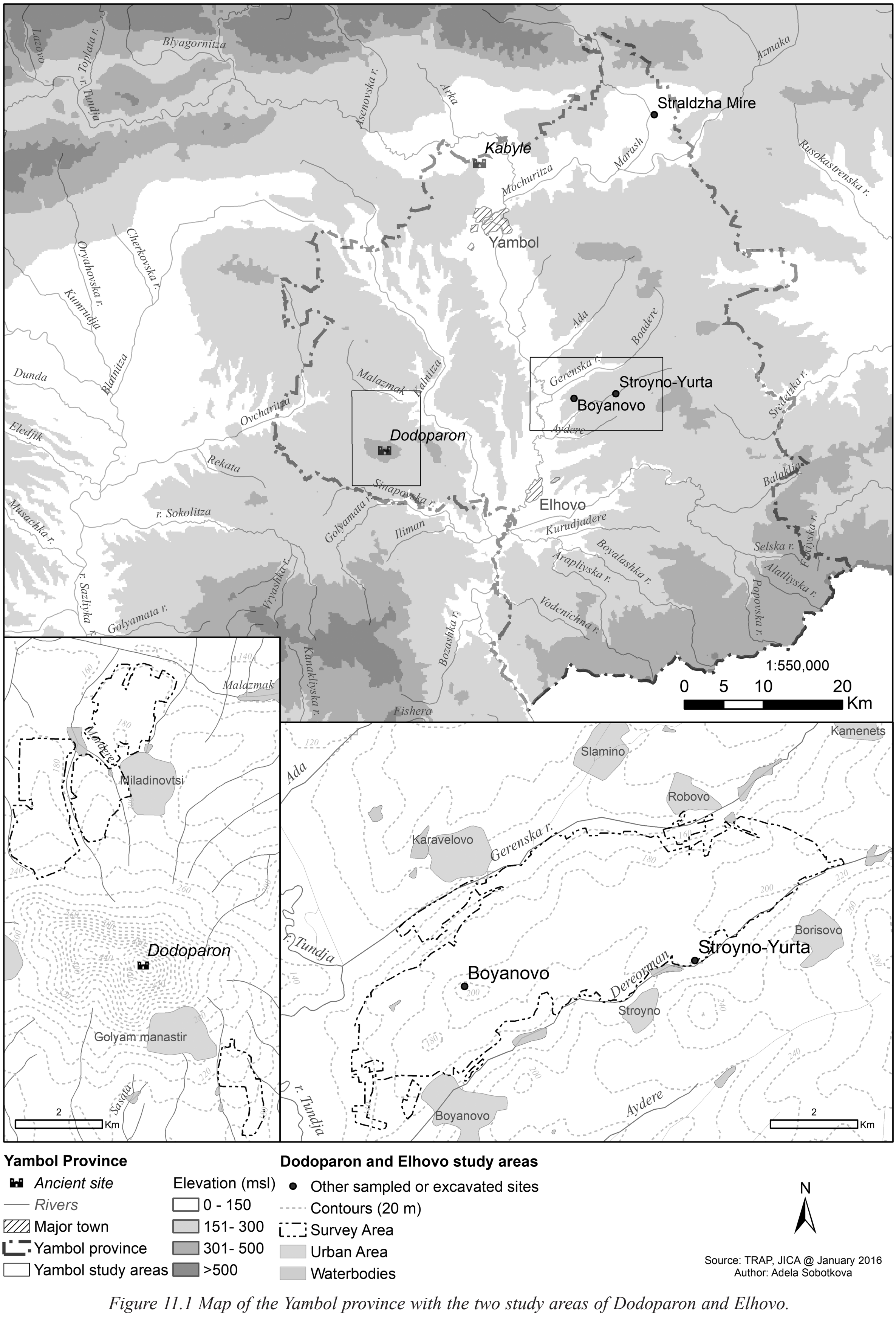


Figure 11.1 Map of the Yambol province with the two study areas of Dodoparon and Elhovo.

Figure 11.2 View of the Yambol province landscape, from the Elhovo study area north to the Stara Planina.

Figure 11.3 Ploughed fields south of the Kabyle outcrop, looking north. Fieldwalking of this area took place during 2008 TRAP pilot project.

for TRAP. The Thracian Plain, however, dominates the northern half of the province, formed from Cretaceous and Paleogene sediments. The plain is flat to rolling, its modern surface shaped by Quaternary alluvial deposits of the Tundzha River and its tributaries, lying at an elevation of 100–150 masl. Occasional rocky outcrops of Triassic and Cretaceous limestone, sandstone, or andesite provide vantage points over the landscape (Dabovsky and Savov 1989; Tsankov *et al.* 1992). The hill of Kabyle (ca. 230 masl, see Fig. 11.3) and the Bakadzhitsite peaks (515 masl at Asan bair) rise from the northern part of the Yambol plain. Moving south, the plain gives way to the Svetiilijski and Manastirski Vazvishenniya (600 masl at Gradishte, see Fig. 19.1) in the west. These hills are formed by outcrops of Cretaceous gabbro, the lowlands between by Quaternary deluvial and prolluvial sediments, gravels, and clays (Kozhuharov *et al.* 1994). Still further south and east, the Strandzha mountain range (710 masl at Golyamo Gradishte or 1,031 masl at Mahya Dağı in Turkey) dominates the southeast. The Sakar and Derventskite uplands (555 masl at Giurgen bair) lie in the far southwest (Stefanov 2002, 39; OAY 2015: 'Geografiya – Relef').

11.3 Administrative organisation and demography

The census of 2013 lists 127,176 inhabitants in the Yambol province (NSI 2015 'Population' 6.1.1 and 6.1.4). Residents live in four towns and 105 villages distributed among five districts: Yambol, Tundzha, Elhovo, Straldzha, and Bolyarovo. In 2013, 70% (89,175) of the regional population lived in urban centres, and 80% of this urban population (72,159 as of 2013, 6.1.1, 6.1.4) was concentrated in the city of Yambol. The average population density in the Yambol province was 38 people per sq km in 2012, compared to 112 people per sq km in Kazanlak, 64 people per sq km in the Stara Zagora province, and 67.3 people per sq km in Bulgaria as a whole. Yambol province had the fifth lowest population density of 28 provinces in Bulgaria in 2012.

When TRAP operated in Yambol, many contrasts to Kazanlak became apparent. The first was the relative lack of industry and greater poverty of the Yambol province. Regional economic output indicators capture this difference well. Bulgaria is classified as an 'upper-middle income developing country' by the World Bank, with a Gross National Income per capita of 7,280 USD in 2013 (World Bank 2018). In 2010, economic output in the Stara Zagora province, which contains the Kazanlak municipality, was approximately 9,814 USD (14,475 BGN) per person, while it is only 5,145 USD (7,589 BGN) per person in the Yambol province. The gap had closed to 10,953 USD (16,155 BGN) versus 7,266 USD (10,717 BGN) respectively by 2013. GDP per capita for the entire southeast Bulgarian administrative unit (which includes both provinces) in 2010 was 7,869 BGN (compared to 9,544 BGN for Bulgaria a whole); in 2013 that figure had risen to 9,186 BGN for southeast Bulgaria (compared to 11,050 for Bulgaria as a whole). The services available in the Kazanlak municipality versus the Yambol province offer another indicator of comparative development. In 2013, the Kazanlak municipality website listed over 20 registered accommodation establishments (Obshtina Kazanlak 2013) or 60 registered in the Stara Zagora province, while only 20 are registered in the entire Yambol province, although it is six times the area and has twice the population of the Kazanlak municipality (NSI 2015 'Regional statistics').

11.4 Environment

11.4.1 Climate

The Yambol province is one of the warmest areas of Bulgaria (Velev 2002, 156). The climate is transitional between Mediterranean and temperate continental, the specific Köppen-Geiger classification is Cfa, a 'humid subtropical' climate (Climate-Data.org, Climate: Yambol). It is characterised by relatively short and mild winters, and hot and humid summers (Fig.11.4). During the coldest month of January, the average temperatures across the region vary between 0–1.5° Celsius, and night time temperatures below 5° Celsius are common. Average temperature in July is 23° Celsius, and summer temperatures regularly reach 38–40°. The region enjoys some 180–210 frost-free days per year. Temperatures over 10° Celsius can be expected to last from 10 April through 25 October (±10 days), while total insolation (hours of sunshine) ranges from 2,200 to 2,250 hours per year (OAY 2015, 'Geografiya – Klimat'; raw monthly temperature data for the Yambol province was not available at the time of writing). Relative humidity varies through the year, with a minimum in July and August (at 60–64%) and a maximum between December and February (80–92%). Figure 11.4 compares the average temperatures between the towns of Yambol and Elhovo, showing 1–2°C higher average temperatures in the latter.

Precipitation is variable and irregular. Annual rainfall averages 530–700 mm, depending on local topography. The Yambol rainfall average is slightly higher than in Kazanlak, or than the Bulgarian average, but the rainfall is differently distributed through the year. There are three annual maxima in the spring and winter (May, November, and December) and two minima (August and February). The absence of rain during July and August and its abundance in winter months is consistent with Mediterranean climatic influence on Yambol (Kirilova 1985 cited in Gaydarska 2007, chapter 4). The maxima and minima are, however, unreliable, and have consistently diverged from the norm in recent decades. The summer months can suffer droughts; during 2000 only 26.4 mm of rain fell in July. Irregularity and occasional shortfalls of summer precipitation require irrigation for agricultural crops.

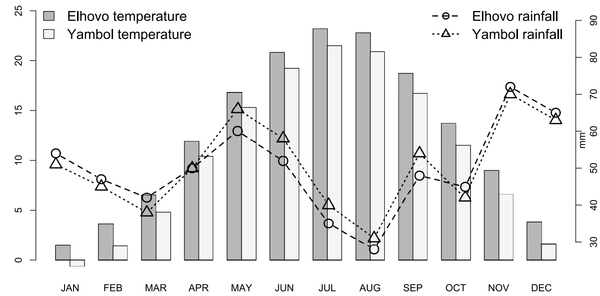


Figure 11.4 A comparison of average temperature (°C) and rainfall (mm) between Yambol and Elhovo towns. Based on data from 1982–2012. Sources: Climate-data.org 2015: Yambol, Climate-data.org 2015: Elhovo.

11.4.2 Water

The Middle Tundzha River is the geographic and archaeological focal point of the Yambol province. The Tundzha springs from the Stara Planina in the Plovdiv province and flows eastwards through the Kazanlak Valley, then into the Thracian Plain near the town of Sliven. Some 10 km north of the town of Yambol, the Tundzha River bends nearly 90° south. Near the town it flows in one wide channel and a few smaller braids. Further to the south, the river returns to a single, well-defined channel and its valley assumes an asymmetric profile, with a steep western bank and a gently sloped eastern bank. At Konevetz, the valley bottom widens to 3 km and the river meanders. South of Elhovo, the river forms a natural border between the Yambol and Haskovo provinces. South of Knyazhevo and Granitovo, a symmetrical gorge encloses the river with steep slopes on both sides. The speed and inclination of the river increase, and rapids appear. Further south, the river flows briefly through the Haskovo province. Between the villages of Srem and Ustrem, the valley of Tundzha River widens again. The speed of the stream decreases, the river becomes muddy and forms deep pools and islands. South of Ustrem, as the Tundzha River again becomes the border between the Yambol and Haskovo provinces, the valley narrows as the river enters the more rugged terrain of the Sakar foothills. These conditions continue as the Tundzha River flows out of the Yambol province, forming the border between the Haskovo province and Turkey, and eventually into Turkey, where it joins the Maritsa River at Edirne (Christov 1969, 209; Varbanov 2002, 184–5).

The biggest tributaries of the Tundzha River are the Mochuritsa, Popovska, and Kalnitsa Rivers. The water levels in the Tundzha River catchment swell between November and April, as the network absorbs the snowmelt and 80–90% of annual water supply flows through. Floods peak during April (Knight and Staneva 1996, 351, table 1). Given the expansive lands east of the Tundzha River, and relatively low water levels during summer months in the Tundzha tributaries, several reservoirs have been built to provide for summer irrigation. The tributaries contribute water to the South Bulgarian Hydrocomplex, a network of channels used for irrigation, transport, and electricity generation between Karnobat and the Maritsa River (Uzunov 1966, 284). In the Yambol province itself the Middle Tundzha component of this irrigation system is fed by the Zhrebino Reservoir and Malko Sharkovo Reservoir on the Popovska River. Some 16,610 ha of the Yambol province benefit from irrigation system (1966, 290–2).

Figure 11.5 Water station at the foot of the Kabyle outcrop (white square building). Note the Late Roman remains in the foreground, which are part of the Kabyle Archaeological Reserve.

There are a number mineral water sources, including thermal aquifers, in the north east of the Yambol province. The most well-known ones are near the villages of Stefan Karadzhovo, Straldzha, and Pravdino (OAY 'Vodni Resursi'). While the thermals hold the potential for balneological industry in the region, the mineral water sources also offer an important reserve of drinking water in periods of drought. Hydrologists agree that 'Bulgaria has the most favourable conditions in Europe for the formation and reproduction of deep and very pure drinkable thermal waters' (Shterev and Zagorchev 1996, 43). Even though Yambol suffers from the Mediterranean imbalance between summer and winter rainfall, the province nonetheless contains abundant water sources which, pending proper management, are conducive to long-term exploitation.

The abundance of water in the Yambol region is reflected in the evidence of past wetlands. Historical maps of Yambol drawn by the German Generalstab der Luftwaffe show extensive swamps north of Yambol city and east of the Straldzha village as late as 1940 (Luftwaffe 1940). The Straldzha wetland, also called the Atolovo Mire, had partially been drained in 1920s. As part of the June 1919 peace treaty, Bulgaria was obliged to accommodate some 200,000 refugees from Aegean Thrace. An amelioration program targeted some 25,000 ha of wetlands and floodplains in Bulgaria, draining some and correcting others to secure agricultural land for the new population (Uzunov 1966, 19). Today the drained Straldzha wetland serves as a clay quarry. The Quaternary deposits are used for roof tile production, and Straldzha tiles can be seen throughout the country. The management of the wetlands on both banks of the Tundzha River (visible on the 1940 map) north of Yambol city took a different turn. The river has been diverted into multiple canals and deciduous forest was planted to absorb the excessive water. By 2008, when TRAP teams went searching for a suitable pollen sampling site following the historical maps, there was no surviving wetland in this forest north of the city.

11.4.3 Soils and land use

Cinnamonic forest soils, podsols, and litosols prevail in elevated areas such as the Svetiilijski and Manastirski Vazvishenniya, as well as the slopes of Strandzha and Stara Planina rising above the Thracian Plain. These less humic and better-drained soils are suitable for fruit orchards, vineyards, and tobacco (OAY 2015, 'Geografiya – Pochvi'; colour figure 10).

The gentle terrain, fertile and varied soils, and mild climate, have attracted human settlement since the remote past. Today much of the Yambol province is agricultural (77%). In 2013, 62% of the land in Yambol province was used for dryland farming, 8% for irrigated farming, and 7% was lying fallow. Forests cover some 15% of Yambol, while the remaining 7% is divided among urban areas, bodies of water, zones of transport, mining, and other infrastructure (NSI 2015 'Regions', table II-12).

Most of the arable soils are concentrated in the Tundzha municipality and dedicated to growing grains (durum, soft wheat, spelt, barley, maize), oil seeds, sunflower, poppy seed, cotton, tobacco, forage plants, and vegetables. Perennial crops include fruit (apples, pears, mulberries, plums, apricots, quinces), nuts (almonds, walnuts), and vines (NSI 2015 'Economic accounts').

Figure 11.6 Fallow fields and grazing donkey.

Yambol's forests are concentrated in the municipalities of Elhovo and Bolyarovo in the southern half of the region. Most of the forests are dense oak scrub rather than mature forest. In prehistory, the greater part of the Thracian Plain along the Middle Tundzha River was covered by oak forests (see Chapter 13 and Connor *et al.* 2013). According to Bondev (1991), forests of *Quercus cerris* and *Q. virgiliana* grew on the well-drained soils of the rolling hills and valleys used today for farming. Forests of this type extended from around Rakovski near Plovdiv in the west to Burgas in the east – a distance of over 200 km. The cinnamonic and *smolnitsa* soils in Middle Tundzha River suggest that forests and grasslands were once widespread across the hilly lowlands where today there are vast expanses of cultivated land (Dennell and Webley 1975; Shishkov and Kolev 2014). Low lying alluvial terraces along the Tundzha River had woodlands of a mixed composition – *Ulmus minor, Fraxinus oxycarpa, Quercus pedunculiflora* and others, similar to the original vegetation of the Kazanlak Valley. In many cases these woodlands have given way to fields, pastures, or tree plantations. Poorly drained areas are occupied by reed swamp vegetation (*Phragmites australis*), with patches of halophyte vegetation where the soils are saline. Hilly or rocky areas, being less attractive for agriculture, often have remnants of oak dominated woodland, although with different species composition to the plains (*e.g.*, *Q. cerris* and *Q. frainetto*), the inclusion of oriental hornbeam (*Carpinus orientalis*), and some Mediterranean species. Christ-thorn (*Paliurus spina-christi*) thickets are commonly found as regrowth where this type of vegetation has been cleared, especially under the influence of livestock grazing (Fig. 11.6).

11.5 Research areas

In the Yambol province, TRAP investigated a different study area each of two seasons (see Fig. 11.1). In 2009, the focus was on an area bounded by two eastern tributaries of the Tundzha River. This study area lay in the Elhovo district, approximately 30 km south of Yambol city and 9 km north of Elhovo, just east of the Yambol–Edirne Highway. It spanned the administrative zones of seven villages: Karavelovo, Slamino, Robovo, Boyanovo, Stroyno, Borisovo, and Kamenetz. A previously known Roman veteran settlement lies within this study area near the modern village of Stroyno, and dates to the late first through early third century AD. This settlement has been investigated by the Yambol History Museum (Bakardzhiev 2007; Chapter 18 this volume). The 2009 study area is referred to as the 'Elhovo study area' in this volume. In 2010 TRAP teams surveyed agricultural fields and pastures surrounding the village of Golyam Manastir. The locale is some 25 km west-southwest of the Elhovo study area and spans the administrative zones of three villages: Golyam Manastir, Miladinovtsi, and General Toshevo. A densely forested hill called Gradishteto rises between these villages. Ruins atop this hill have been identified as ancient Dodoparon, the likely site of a temple of Apollo in the Hellenistic and early Roman periods, and a fortified settlement in the later Roman and Byzantine eras. TRAP and the Yambol History Museum conducted trial excavations at Dodoparon in 2010 (see Chapter 19). Since contextualising this site was the primary purpose of surface survey in 2010, that survey area is called the 'Dodoparon study area' in the TRAP Report.

11.5.1 Elhovo study area

The 2009 study area includes approximately 40 sq km bounded to the north and south by two streams flowing westward into the Tundzha River (the Dereorman and the Gerenska Rivers respectively), on the west by the Yambol–Edirne Highway, and on the east by a forested area (see Fig. 11.1 bottom right). The landscape rises above these two streams, from alluvial terraces, through rolling hills, to a broad ridgeline. Elevation within the study area ranges from 90 masl at the streams to 210 masl along the ridgeline. The outcrops along the ridge feature Jurassic schist, sandstone, and limestone, occasionally lined with marble, and host a large, modern quarry (see colour figure 9 and Fig. 17.1). The terrain below the peaks is formed from Neogene sands and clays with occasional pockets of Paleozoic granite or porphyry and Cretaceous breccia and flysch (Dabovsky and Savov 1989). Soils that evolved on them are relatively rich humic *smolnitsas*, occasionally containing significant amounts of eroded limestone (Shishkov and Kolev 2014; see colour figure 10).

The land in the Elhovo study area is primarily devoted to annual agriculture, with some areas of pasture, scrub, and forest. The streams have been channelised, but wetlands still flank parts of each watercourse. Crops include grain (wheat, barley, and rye), sunflowers, and hemp. Agriculture is mostly mechanised and relies on conventional ploughing, but at the time of survey still

Figure 11.7 A view looking southward from the acropolis of Kabyle showing agricultural fields and modern village of Kabile below and the Gradishteto Hill with Dodoparon on the horizon (rightmost prominence).

utilised older equipment for the most part, typically turning the earth to a depth of 25–40 cm (after which the soil is harrowed prior to planting). Pastoral practices involve herdsmen on foot driving cattle, sheep, goats, or even poultry (turkeys and guinea fowl) from their stalls and pens in the villages every morning, out to harvested or fallow fields, dedicated pastureland, or areas of otherwise unused scrub, and then bringing them back again every evening. Forests are well defined and heavily utilised, consisting entirely of second growth timber, both deciduous and evergreen. The landscape is managed in such a way as to place all three types of land – agricultural fields, pasture, and forest – within easy reach of each modern village.

In its wider context, the study area straddles one of the first ridgelines south from the bend of the Tundzha River across the Thracian Plain and toward the Strandzha Mountains. As the Tundzha River flows southward just west of the study area, the surrounding land becomes more rolling. As a result, the Elhovo study area represents a transitional zone between the Thracian Plain and the upland zone of southern Yambol; to the north, low rolling hills and a flat plain extend about 60 km to the Stara Planina, while to the south an increasingly folded

landscape of hills and ridges rises gradually toward the Strandzha and Sakar Mountains, some 30 km distant.

The demographic profile of villages in the Elhovo area is skewed towards a middle-aged and elderly population. Most residents are engaged in agricultural activities and services, or commute into nearby cities of Elhovo, Topolovgrad or Yambol for work.

11.5.2 Dodoparon study area

In 2010, TRAP investigated the environs of the ancient and Mediaeval site of Dodoparon. Dodoparon lies 20 km due west of the Tundzha River, and approximately 25 km west-southwest of the TRAP 2009 Elhovo survey area. It is situated near the summit of Gradishteto (ca. 600 masl), a rugged peak dominating the landscape (see Figs. 11.1 bottom left and 19.1). The site commands a view of the Thracian Plain as far as the outcrop of Kabyle some 60 km to the northeast. The peak is surrounded by hills, called the Manastirski Vazvishenniya, which give way to a rolling plain that is crossed by the Malazmak and Mordere streams flowing east to the Tundzha River. Geologically the hills are formed by the Cretaceous Manastirski pluton of gabbro and gabbro-diorite rocks with numerous magnetite and ferrous deposits. Below the hills lie much younger deposits of Neogene (northern part) and Quaternary (southern part) clays and gravel deposits (Kozhuharov *et al.* 1994; colour figure 9).

The soils change with the elevation from fertile *smolnitsas* on stream terraces to forest soils on the slopes of the hills (colour figure 10). Dense vegetation ensures that the hillsides have well developed soil horizons (40 cm), despite the steep slopes. Igneous (granite and gabbro), ferrous, and limestone fragments of various sizes, from rocks to boulders, are scattered across hillside meadows and the agricultural fields below Gradishteto. The study area sampled these varied environments, ranging in elevation from 200 to 600 masl.

Gradishteto and the surrounding hills are covered with closed oak forest interspersed with scrub and meadow. Forested areas are exploited for fuel and building materials, but quickly become impenetrable due to dense growth of scrub oak and other vegetation. Scrub and meadow are used to pasture animals or hunt wild game. Agricultural fields extend from the flanks of the hills across the plain. Vines, fruit trees, maize, and grain (wheat, barley, and rye) dominate. Agricultural and pastoral practices are similar to those of the Elhovo study area. The agricultural lowlands could be walked systematically, while the hills and uplands had to be sampled opportunistically where terrain and vegetation allowed. In its wider context, the Dodoparon study area is further along the gradient from plain to uplands, and includes a prominent peak. This part of the Thracian Plain is rolling, growing flatter northward and hillier southward. To the south, peaks like Gradishteto Hill become more common, until the Plain gives way entirely to more rugged terrain.

The demographic profile of the villagers in the Dodoparon study area is again skewed towards middle-aged and elderly residents. They mostly comprise farmers or commuters working in the cities on the Black Sea coast, or in local factories such as the Maritsa II power plant. Golyam Manastir residents (right under Gradishteto) comprise a community of retired miners who spent their working lives extracting zinc and lead from now decommissioned local mines.

11.6 Conclusion

The two TRAP study areas in Yambol province, Elhovo and Dodoparon, are located in the southern portion of the province to the east and west of the Tundzha River respectively. Each area features a unique landscape within the Middle Tundzha River catchment, but they share the dominant traits of the Yambol province such as the prevalence of agricultural lands, isolated stands of cultivated forests and unmanaged oak scrub, good access to water sources, and a rural way of life. Among the expansive tracts of fields figure small vineyards, water stations, artificial reservoirs, and rocky outcrops used for quarrying or mining. Local communities comprise retired miners or farmers, as well as an increasing portion of western European seniors.

Both study areas offer fertile soils for farming or pasture, easy access to water sources, and stone- and ore-bearing outcrops. While easily accessible today, both landscapes require management to prevent the spread of impenetrable scrub oak. In addition to the resources available in the landscape, the hills and forests also offer refuge from external threat.

12

A history of archaeological research in the Yambol province

Todor Valchev

Abstract *This chapter reviews the history of archaeological investigations in the Yambol province in Bulgaria from the nineteenth through the early twenty-first century, tracking the development of archaeological practice as it evolved from an informal and exploratory activity to a systematic, professional, and institutionalised endeavour. This chapter provides an overview of major research and rescue archaeology, discussing its rationale and impact on our understanding of the culture history of the Yambol region.*

Keywords *Yambol province; historiography; history of archaeological research*

12.1 Introduction

The history of archaeological investigations in the Yambol region starts after the liberation of Bulgaria from Ottoman rule in 1878. It can be loosely divided into four phases that roughly follow developments in the country's political history. The initial mapping of cultural heritage within the region and the informal exploration of specific site types occurred after Bulgaria gained political autonomy and began to administer and manage its own territory. After the 1950s, Bulgarian archaeology became institutionalised and more scientifically oriented. Bulgaria's inclusion in the Soviet sphere of influence endowed Bulgarian archaeology with a strong materialist flavour and a predisposition for large, international, centrally funded rescue and research projects. Multidisciplinary teams worked for years exploring entire sites in their environmental context, producing valuable insights into the history of the region. After the fall of the Iron Curtain, Yambol archaeologists grappled with the accelerated decline of cultural heritage under the attack of looters. In addition, archaeologists struggled to satisfy the demand for rescue work necessitated by new infrastructure and economic development. Despite the difficulty of rapid, small-scale excavations, these rescue projects generated valuable new data, complementary to the previous large-scale research. The turn of the twenty-first century saw the Yambol History Museum fortified by previous experience and ready to engage in a balanced mixture of large-scale research and rescue projects, employing new digital technologies to improve the documentation and the management of the archaeological heritage of the region.

12.2 Amateur beginnings

After the liberation of Bulgaria from the Ottoman Empire, mapping of the geological, economic, linguistic, and cultural diversity of the region became the first endeavour of the young country. Archaeological remains visible on the surface, such as prehistoric settlement mounds, dolmens, and ancient and Mediaeval fortresses, were mapped in the Yambol province as well as throughout the country with the help of the Czech brothers, Hermenegild and Karel Škorpil, Czech historian Konstantin Jireček, and homegrown scholars Georgi Bonchev, Vasil Mikov, and Petar Detev (Mikov 1933a, 76; Detev 1950, 68–73; Panajotov 1976, 52–3; Delev 1982b, 174–5; Velkov 1982, 7–9; Iliev 2009a, 7).

The purpose of the earliest archaeological excavations was to gather artefacts for museum and school collections. These excavations usually involved spit excavations in trenches of variable size. The excavators focused on the recording of finds, but not on stratigraphic sequence, which led to errors in the dating of the finds and their interpretation (Dimitrov 1964, 1; Georgiev 1964, 61–2).

The first archaeological excavations began with the 1898 campaign of the French priest Père Jerome at the

Rasheva mound near the city of Yambol. His discovery of a multi-layered settlement piqued the curiosity of the French team of Georges Seure and Alexandre Degrand. Seure had been a junior academic at the French School at Athens, Degrand the French consul at Plovdiv. They conducted trial excavations at Rasheva mound between 1899 and 1903 to determine its purpose (Seure and Degrand 1906, 364–84). These early excavations were driven by questions surrounding the date and function of Bulgarian tumuli, which were all considered to be burial mounds at the time. Seure and Degrand found mudbrick walls, food remains, and domestic assemblages – but still interpreted these finds as the contents of tombs, in accordance with the accepted theory. Despite this error about function, the prehistoric date of the mound became clear. Although Seure and Degrand were hoping to find an historical monument, or perhaps a Mycenaean tomb, the significance of Rasheva mound for Thracian prehistory was clear: 'Les fouilles récemment entreprises ne nous ont que très imparfaitement renseignés sur l'histoire de la Thrace; mais elles nous en laissent deviner la préhistoire' (Seure and Degrand 1906, 359). Materials they excavated can now be seen in the Louvre, Paris. Later studies classified the Rasheva settlement mound artefacts as Karanovo V culture, which means the settlement was in use during the Early Chalcolithic period (Todorova 1986, 62; Lichardus and Iliev 1994, 13–14; Lichardus *et al.* 2002a, 328; Iliev 2009a, 8–9).

Another series of early excavations focused on the ancient town of Kabyle, next to the modern village of the same name, some 7 km north of the city of Yambol. Bulgarian scholar Bogdan Filov put a small sondage on the fortress wall and gate of the ancient town to determine its date (Filov 1913b, 315; Velkov 1982, 10; Iliev 2009a, 9).

Besides these excavations at what turned out to be settlement mounds, the first burial mounds also began to be excavated. These included a burial mound near Lyulin village (Botusharova 1950, 258; Getov and Popov 1972, 42; Iliev 2009, 8), one near Oreshnik village (Velkov 1957, 315–16), one near the town of Straldzha (Dimitrov 1933, 386–93), and two burial mounds near the town of Yambol (Seure 1925, 396–9; Velkov 1935, 462). These mounds were initially quarried for soil and building material, and later excavated by local history teachers interested in the mounds' origins.

Alongside the first excavations, archaeologists conducted the first informal surveys. In the 1930s, Vasil Mikov and Petar Detev mapped the settlement mounds near Bolyarovo, Boyadzhik, Drama, and Krumovo (Mikov 1933a, 76; Detev 1950, 68–73).

In 1925, two historical societies were founded in Yambol, 'Diana' and 'Diampolis'. In 1937 another society called 'Dolmen' was founded in Topolovgrad. Members of these societies offered public lectures on historical topics and ran archaeological excavations in the territory of Yambol. Most of their work focused on the ancient town of Kabyle, a burial mound near Yambol, and finally, the settlement mound near Veselinovo village (Petrov 1979, 229–33).

In 1935, Vasil Mikov, provoked by surface finds the local scientific society had reported, excavated the Maleva mound. Mikov excavated a 10 × 20 m trench in the highest part of the mound to the depth of 5.30 m, where he reached sterile soil. He recorded all the pottery finds and, based on contemporary knowledge of prehistoric pottery in the Balkans, he dated the Maleva mound to the Bronze Age. During a recent reassessment, however, the finds were redated into the Middle and Late Neolithic period (cultures Karanovo II–III and Karanovo III) and Early Bronze Age (Ezero A and Svetikirilovo) (Mikov 1929, 171; 1941, 195–96; Petrov 1979, 231; Lichardus and Iliev 1994, 15; Lichardus and Iliev 2000, 76; Lichardus, Iliev and Christov 2002, 329; Iliev 2009a, 9).

12.3 The systematisation of archaeological activity in Yambol

A turning point in the archaeology of the region came with the founding of the Yambol History Museum after World War II. The ethnographic and archaeological collections of local historical organisations were moved to the newly established museum, which opened to the public in 1953. Establishing the museum marked a systemisation of archaeological investigation, including the development of a permit process and the protection, conservation, and exhibition of cultural heritage. The Yambol History Museum continues to curate this collection and manage the region's cultural heritage to this day.

In terms of field work, the entire country underwent a post-war shift from privately funded campaigns aimed at the retrieval of artefacts to systematically conducted excavations by teams of specialists with more rigorous documentation. The use of stratigraphic excavation within a grid of trenches over large sites became the norm. Stratigraphic relationships were monitored with the help of standing profiles, and cultural layers were defined on the basis of artefacts, as well as other traits of the deposit, thanks to more detailed and systematic documentation. The main incentive behind the change was the shift of interest from the assemblage of artefacts to their stratigraphic position and context, which enabled the assessment of site occupation history (Georgiev 1964, 63–6; Dimitrov 1964, 3).

Teams working in the Yambol region now became more professional and specialised, comprising staff from the Yambol History Museum, the National Institute for Immovable Cultural Heritage, the National Archaeological Institute, and Sofia University 'St. Kliment Ohridski'. The teams worked on both research and rescue projects.[1]

12.3.1 Select investigations

From 1963 to 1985, Dora Dimitrova, Zhelyazko Popov, and Ivan Krajchev undertook rescue excavations at the medieval fortress of Yambol in the northwest part of

the modern town. The fortress occupied a natural hill above one of the meanders of the Tundzha River. The excavations revealed a section of the fortress wall, storage and living buildings, and three contemporary necropoleis. Below the fortress lay a small settlement, the earliest remains of which were dated to the sixth century AD. It extended to about 1 ha in an irregular form. At the end of the tenth century AD, the settlement was restored and fortified, when the territory of Yambol fell within the Byzantine *theme* of Macedonia. During the twelfth and thirteenth centuries AD, Yambol was important for its location on the border and functioned as a major centre, while periodically passing between Bulgarian and Byzantine control. In the summer of 1373, Yambol was captured by Timurtash Bej and remained Ottoman until the liberation of 1878 (Dimitrova and Popov 1978, 29; Dimitrova and Krajchev 1980, 209; Krajchev 1981, 149–50; 1982, 108; Dimitrova 1986, 169–74; Yankova 1995, 85–92; Iliev 2009a, 10).

In 1966, the digging of a sewer in the Avren neighbourhood of Yambol city uncovered two brick tombs with lavish Late Antique assemblages. The grave goods that surrounded the inhumations, including metal and glass vessels, were of great artistic and intrinsic value. The metals included a gold cross-like fibula, a gold ring, a silver-plated buckle with engraved decoration, a silver buckle with 15 bronze belt studs, a bronze vessel, and a separate bronze handle. The glass inventory comprised a cup, a flask, two bottles, a *lacrimarium* (tiny vase for unguents or oils), and a *vasa diatreta* (cage cup). The ring comprised a round loop of gold and an oval shield with an intaglio seal with a bust of a front-facing man, an image of Emperor Constantine the Great. The graves have been attributed to local noblemen or retired military officers. The finds date to the first half of the fourth century AD and represent some of the earliest signs of occupation within Yambol city during antiquity (Dimitrova 1972, 239; Dimitrova and Popov 1977, 235–6).

In 1966, Dimitar Ovcharov undertook sondage excavations along the Great Fence of Thrace (Erkesia), a strategic defensive structure built during the First Bulgarian Kingdom for defence against the Byzantines in Thrace. It is known from the written sources, including Skilitsa-Kedrin, Simeon-Metafrast, and Teofan, to have been built during the eighth and ninth centuries AD. It had a total length of 131 km. The remains of the ditch, cut east–west across the Yambol province, were documented by Jireček in the nineteenth century (Jireček 1888, 504–5). Archaeological investigation of a section of the Fence was undertaken near the village of Lyulin. Ovcharov established that the ditch had a trapezoid cross section, being 6.5–7 m wide at the top and 2.3–4 m at the bottom. It was 2–2.5 m deep. The embankment on the north side of the ditch was 2.5 m tall. The presence of the Great Fence of Thrace across the middle of the Yambol province points to its status as a border zone during the Byzantine period (Grigorov and Vasilev 2007, 160–3; Iliev 2009a, 9).

During the 1970s, the pace of archaeological investigation increased. Under the aegis of the National Institute for Immovable Cultural Heritage, Dora Dimitrova and Zhelyazko Popov conducted a survey of the entire Yambol region, registering 205 archaeological sites. The sites included a wide variety of types, from settlement and burial mounds to flat settlements and both prehistoric and historical necropoleis. The results from this field survey were published in a catalogue with overview maps and represent the single most comprehensive publication of prehistoric to late Mediaeval sites in the Yambol region to date (Dimitrova and Popov 1978).

In 1972, a team led by Professor Velizar Velkov, with specialists from the National Institute of Archaeology, the Institute of Thracology in the Bulgarian Academy of Sciences, Sofia University 'St. Kliment Ohridski', and the Yambol Historical Museum, began planning annual excavations in the territory of the ancient town of Kabyle. These excavations are still ongoing. The city, positioned on a rock outcrop (called Zaichi Vrah) 7 km north of Yambol, had been known from coin finds and Greek texts (Demosthenes 8.44). The excavations gradually revealed the urban amenities of Kabyle, including the fortification walls, the rectangular building on the acropolis at the top of Zaichi Vrah, Roman barracks, Roman baths, a basilica, a church, and storage and administrative buildings. Outside the city's walls, a flat necropolis and several Roman-period burial mounds were investigated (Velkov 1982, 13; Iliev 2009a, 9–10). The history of settlement emerged from these investigations. The earliest habitation in the territory of ancient Kabyle dated to the Late Chalcolithic. During this period, a settlement mound was located on the place that later became the Roman military camp. A small settlement existed at the foot of Zaichi Vrah with a presumed sanctuary on its summit during the Late Bronze Age. This settlement grew into a larger centre during the Early and Late Iron Age. In 342 BC, during his conquest in Thrace, Philip II of Macedon took Kabyle, fortified and garrisoned it and made it a part of his administrative system in Thrace. In the third century BC, the Thracian dynasts Spartok and Skostok took control of Kabyle, which by then was a major political and economic centre in inland Thrace, minting its own coins with images of Greek deities (Draganov 1993, 102–8). In 72 BC, when Marcus Lucullus undertook a campaign against the Black Sea towns, he took Kabyle. By 45 BC both the town and the territory of Thrace were annexed to the Roman Empire. Kabyle became one of the administrative centres of the province of Thrace, housing a permanent garrison with one cohort.

In AD 313, the town became an episcopal centre with a resident bishop. During the sixth century AD, Avar attacks in the provinces of the Roman Empire overwhelmed Kabyle, which was abandoned until the

renewal of settlement during the tenth and eleventh centuries (Gergova and Iliev 1982, 13–15; Draganov 1993, 102–8).

Another major expedition in the period 1973–1976 that extended to the Yambol region was led by Professor Alexander Fol of the Institute of Thracology in the Bulgarian Academy of Sciences. This expedition investigated the nature and date of the megalithic structures in the Strandzha and Sakar Mountains. The structures comprised megalithic chambers with walls covered with an architrave of stone slabs, occasionally with a dromos leading to it. The project documented the spatial occurrence and diversity of the megalithic remains, where exposure was evident. Several others that were still under mounds were excavated and their contents mapped and dated with contextual finds. Three of these dolmens were situated in the Yambol province at the time, near Sakartsi and Hlyabovo villages. One of them featured an inhumation burial and an assemblage including the remains of iron and bronze fibulae, ceramic fragments, and a bronze spiral bracelet, ring, and earrings (Panajotov 1976, 40; 48–9; 63–7; Delev 1982b, 175–241; Iliev 2009, 7). The excavation demonstrated that dolmens were mortuary monuments that were used repeatedly from the eleventh to sixth century BC. The field surveys that contributed to the mapping of these dolmens also documented unknown settlements from the Early Iron Age. The participants of the ‘Sakar’ and ‘Apolonia–Strandzha’ expeditions associated the ‘megalithic culture’ in south eastern Thrace with the beginning of the Early Iron Age in Bulgaria (Panajotov 1976, 75; Delev 1982b, 173–5; 192; 218–20; 241; Iliev 2009a, 7–8).

In 1977, a team from the Yambol Historical Museum, led by Petar Detev, undertook rescue excavation at the Marcheva mound, a settlement mound situated on the edge of Yambol where a milk factory was to be constructed. The team excavated a trench to a depth of 5.40 m and found the remains of three buildings dated to the Late Chalcolithic (Kodzhadermen-Gumelniţa-Karanovo VI culture) (Detev *et al.* 1979, 7–24; Lichardus and Iliev 1994, 14–15; Lichardus *et al.* 2002a, 329; Iliev 2009a, 10).

From 1979 to 1985, Diana Gergova and Ilija Iliev conducted archaeological excavations at the settlement mound of Yasa Tepe beside the ancient city of Kabyle at the foot of Zaichi Vrah Hill. The excavators concluded that Yasa Tepe was inhabited in the Late Neolithic (Karanovo IV) and the Early Chalcolithic (Karanovo V), Early Bronze, and Iron Ages. Numerous pits from the Late Iron Age represent small settlements near the town of Kabyle (Gergova and Iliev 1982, 12–13; Lichardus and Iliev 1994, 15; 2000, 78; Lichardus *et al.* 2002a, 329–30).

From 1979 to 1993, an archaeological team led by Jordan Alexiev, Mirko Robov, and Neli Tancheva undertook archaeological excavations at the Mediaeval monastery near the village of Voden. The archaeologists wanted to verify the proposition that the monastery belonged to Grigorii Sinai Monastery (Saint Gregory of Sinai Monastery). In the monastic complex of 0.5 ha, the excavations found a church and rooms connected with the daily life of monks, including a workroom (illuminatory), refectory, storage, and sleeping cells. According to the directors, the monastery had two occupation periods: from the fourth–sixth centuries and from the tenth–thirteenth centuries (Aleksiev *et al.* 1989, 152; Tancheva-Vasileva 1998, 189; Iliev 2009a, 10), with the latter period confirmed by 2012 excavations. The lifespan of the site makes the attribution to Grigorii Sinai Monastery possible (Iliev and Valchev 2013, 477).

In the period 1981–1989, Ivan Krajchev excavated the Late Antique and Mediaeval fortress at the Dermen Kalesi locale, some 4.5 km west of modern-day Karavelovo village (just west of the Elhovo study area). The excavations revealed portions of fortification walls, two gates, and a square tower. Inside the fortress there was an administrative building from the eleventh century and two churches from eleventh and twelfth centuries, one with a Mediaeval necropolis. Outside the fortress, an open-air settlement was located to the northeast, and a necropolis to the southeast. The excavations also documented a third century AD settlement below the Late Antique fortress of the sixth century AD. In the ninth to tenth century the fortress was renovated and during the twelfth century it was further improved. It was destroyed and abandoned during in the second half of the fourteenth century during the Ottoman invasion (Krajchev 1989, 130; 1990, 113; Iliev 2009a, 10; Rusev 2009, 5–6).

In 1983, a German-Bulgarian project began to explore the micro-region of the village of Drama, 40 km southwest of Yambol. The multi-year expedition conducted an interdisciplinary investigation of a small (120 m diameter) settlement mound near Drama, in a locale called Merdzhumekya. Residential areas dating to the Late Neolithic and Chalcolithic periods were found, with reduced settlement in the Early Bronze Age. In the Middle Bronze Age ritual elements (a ditch) appeared at the site, but no traces of habitation were found. The team also explored a nearby prehistoric flat settlement near Gerena, dating to the Late Neolithic (Karanovo III and Karanovo IV). In the locale of Kayryaka nearby, a flat Roman necropolis and pit fields dating from the Late Bronze Age through the Early Iron Age were also excavated (Lichardus and Iliev 1994, 16; 2000, 76–8; Lichardus *et al.* 2002a, 330–5; Lichardus *et al.* 2000, 13–15; 2002b, 142; Iliev 2009a, 10; Gleser and Thomas, 2012, 11–13). These interdisciplinary studies included geomorphological, macrobotanical, and zooarchaeological analysis of the excavated contexts (Bökönyi 1986; Kubiniok 1996; Benecke 2002). Systematic field surveys complemented the archaeological excavations at Merdzhumekya and Gerena, but results remain unpublished.

12.4 Managing challenges during the transition

In the decade after the fall of Communism, the archaeological work done by the Yambol History Museum was directed almost exclusively towards rescue excavations. The switch in focus was forced primarily by the limited availability of research funds.

Rescue excavations of 1999 and 2000 by Ilija Iliev, for example, revealed an unknown Late Neolithic (Karanovo IV) site at Turskoto Kyushe near the town of Elhovo (Iliev 2002, 437; 2009a: 10; 2001, 33–4; Lichardus *et al.* 2002a, 336). The results from these excavations shed light on the development of Late Neolithic cultures in the lower course of the Tundzha River. Specifically, the character of the so-called 'white-painted pottery' in this period was addressed.

Two major infrastructure projects deserve special mention for producing a large amount of archaeological evidence through time. The construction of a gas pipeline between Bulgaria and Turkey and the Thrakia Highway, connecting Sofia to the Black Sea, required the investigation of dozens of archaeological sites from the Late Neolithic to the seventeenth century AD.

During 1999 and 2000, seven rescue excavations occurred on the route of the gas pipeline including Early Iron Age ritual pit fields, Late Iron Age and Mediaeval settlements, Thracian and Roman period burial mounds, and new excavations on the Fence of Thrace.[2] While the rescue work was conducted in haste and without a specific research objective, both infrastructure projects provided an interesting and rich random sample of archaeological sites of different periods and types from the region (thanks to their large spatial extent and methodological consistency).

12.5 Large-scale projects, digital methods, and cultural heritage in the twenty-first century

The twenty-first century has seen a return to a normal state of operation at the Yambol History Museum, with new emphasis on more precise digital recording of new information about archaeological heritage and increased monitoring of known archaeological sites. The Museum began actively contributing to the Archaeological Map of Bulgaria, a national electronic register of archaeological sites across Bulgaria. Status reports on new and old sites were submitted electronically and stored in a centralised national database, contributing to synthetic research and more systematic cultural heritage management. Field investigations continued vigorously thanks to infrastructure projects in Yambol, the development of the quarrying industry in the region, and the renewed interest of Bulgarian archaeologists in the burial mounds of the Yambol region.

In 2004, Ilija Iliev and Stefan Bakardzhiev excavated a burial mound near Drazhevo village, which turned out to contain a family tomb of the Early Bronze Age pit-grave culture (similar to the burials in mound 8007, Chapter 17 in this volume). The mound was of medium size, 2.7 m high and 37 m in diameter. The perimeter was lined with a stone *krepis* and, at its centre, pink stone slabs 0.7–0.8 m high were arranged in a circle 11 m in diameter. The stone slabs were quarried 10 km from the mound. A second, smaller circle with a diameter of 2.0 m was located in the northern half of the mound, built from local stone. The large circle contained four superimposed inhumations of a family in crouched positions with ochre decorating their limbs. The small circle contained two cremated burials. The grave goods included ceramic vessels, three bronze stiletto daggers, a bronze knife, six silver spiral pendants, and four circular silver plates with two holes. The excavators interpreted the construction as a family tomb re-used multiple times and associated it with the influx of pit-grave culture bearers to the south of the Stara Planina (Bakardzhiev 2005b, 150–2; 2006b, 124; Iliev and Bakardzhiev 2008a, 4–5; Iliev 2009a, 10; 2009b, 11–14; 2011, 389–90).

In 2004, Daniela Agre and Stefan Bakardzhiev excavated a mound near the village of Valchi Izvor. The mound had a conical form, 5.9 m high and 40 m in diameter. It was built over an Early Iron Age settlement and contained no human burials. Instead, at a height of 2.9 m, a horse sacrifice was found in the centre of the mound. Its surface was covered with 64 pits with spherical, cylindrical, and pear-like shapes. The walls of most of them were coated and burned. The excavators connected the mound with the religious beliefs and ritual practices of the local Late Iron Age residents (Agre 2005a, 145–6; Iliev 2009a, 10–11).

In 2005, Daniela Agre excavated a mound called Golyamata situated between villages Malomirovo and Zlatinitsa. The mound was massive with a height of 12.4 m and a diameter of 82–102 m. Inside, Agre found three Late Bronze Age burials and three later burials including a grave of an unknown Thracian ruler. The Late Bronze Age inhumations were laid in crouched position with ceramic vessels as grave goods. Three later burials were added to the original mound at the end of seventh to sixth century BC (a cremation), in the fifth century BC (an inhumation of a child), and the fourth century BC.

The third burial was laid on top of a platform made of solid planks, covered with a hemp shroud. The unknown prince was buried in full battle gear: an iron sword with a griffin head for a handle, appliquéd with silver nails, 200 bronze arrowheads, seven spears, a shirt of mail decorated with three silver brooches, a bronze helmet of a Chalcidian type with snake emblem, and a gold-plated silver greave with elaborate iconography, including a rider drinking from a *rhyton*, an enthroned Mother goddess, a centaur choking a boar, an eagle carrying a rabbit in its claws,

and a female face in relief (Agre 2006a, 139–40; 2006b, 64–6; Iliev 2009a, 11). The prince had a gold crown, on which a plate featured an image of the goddess Nike holding a crown and a *phial*. A leather band on the crown had 29 gold rosettes mounted on it. In his left hand, he had a gold seal ring with the image of the Great Mother Goddess presenting a cup to a rider. Four silver *phialae* and two silver *rhyta* with gold plated mythological scenes were found in the mound. Other grave goods included a bronze *oinochoe* jug, bronze drinking vessels (situla, sieve, vessels, and dishes), a black-slip stemless cup, *pelike,* an alabastron, and four amphorae of Thasian type. At the feet of the dead ruler lay silver appliques from a horse harness and two iron bits. Next to the burial, a pit contained a sacrifice of two horses and a dog. The tomb was dated in the middle of the fourth century BC and connected with one of the sons of Kersebleptes (Agre 2006a, 140–2; 2006b, 65–6; Iliev 2009a, 11).

During 2006 and 2007, Daniela Agre excavated a burial mound called Raikova near the village of Stroyno. Its height was 10 m and diameter 88 m. It contained four primary burials (inhumations) from the first half of fourth century BC and two secondary burials of a woman and a child. The woman was cremated and her remains placed inside a stone sarcophagus. The sarcophagus had a gabled lid with four acroteria made of soft limestone. The grave goods next to the sarcophagus contained a ceramic *lacrimarium* and a cosmetic box. Two gold rings with intaglios of Orpheus and Demeter, three gold necklaces, two gold earrings, a gold half-moon, two gold beads, three wooden *pyxides*, and a glass *lacrimarium* were found inside the sarcophagus. South of the sarcophagus lay an inhumed child with a ceramic jug at its feet. The two secondary graves were dated to the turn of the second century AD. In addition to the burials, the mound contained a pit with the buried sacrifice of two horses and a chariot (Agre 2007a, 76–7; 2008a, 237–9; Iliev 2009, 11).

Archaeological investigations continued in the northern part of the Yambol province along the route of the Thrakia Highway during 2008–2010. Field surveys identified a variety of site types ranging from a multi-component ritual pit field (with materials ranging from the Late Neolithic to Early and Late Iron Ages) to open-air settlements (Early Iron Age, Late Antique, and Mediaeval periods), necropoleis from the Roman and Ottoman periods, and burial mounds dating to the Early Bronze Age, Early Iron Age, and Classical Antiquity.[3]

Elsewhere in the Yambol municipality, regular excavations continued on pit fields from the Late Neolithic and Late Iron Age, Early Iron Age megalithic tombs, and historic and prehistoric settlements.[4] The pace of burial mound excavation reached historic maximum with 28 mounds excavated between 2005–2010, greatly contributing to the understanding of the variety of remains under mounds and the chronological extent of their use for mortuary purposes.[5]

In 2008, the Tundzha Regional Archaeology Project (TRAP) was launched in Yambol under the supervision of the Yambol History Museum and Sofia University 'St. Kliment Ohridski'. The project ran a pilot season, testing the feasibility of survey in Yambol along the proposed route of the Thrakia Highway (Ross *et al.* 2010). TRAP then evolved into a long-term regional archaeology project, exploring the landscapes of the Upper and Middle Tundzha Basin until 2011. Ilija Iliev and Stefan Bakardzhiev acted as the Bulgarian directors in Yambol, with many Bulgarian and international students and volunteers participating. The systematic pedestrian survey was supplemented by satellite remote sensing and GPS survey of known legacy sites, probing Yambol's landscapes with new technological approaches and generating a fine-grained geospatial record of its past. The digital documentation of new and old sites contributed GPS coordinates, as well as an abundance of cultural heritage observations to the site register of Yambol. The diachronic range of the field survey led to the registration of all types of surface residues, dating from the prehistoric period through Ottoman times (Iliev *et al.* 2012, 9–11; this volume).

In 2008, Stefan Bakardzhiev from the Yambol History Museum launched another long-term project at the Mediaeval castle of Malkoto Kale near the village of Voden. The castle occupies 0.1 ha on top of small hill with limited access. Excavations cleared the west fortification wall with two towers and a series of general use rooms near the wall (Iliev 2009a, 11; Bakardzhiev 2013, 457–9; Bakardzhiev and Valchev 2015b, 703–6). The castle at Malkoto Kale was built during the tenth century as a private residence, when its territory was part of the Macedonian *theme* in the Byzantine Empire. It was destroyed during the Third Crusade led by Frederick Barbarossa (1122–1190).

12.6 Conclusion

Archaeological investigations in the Yambol province began nearly 150 years ago with the first informal explorations sparked by the curiosity of Bulgarian and foreign history enthusiasts. Several decades were spent mapping surface remains of different historic and prehistoric stages of Bulgaria's past, as well as in conducting unsystematic excavations in an attempt to understand the nature of the surface remains, especially large mounds. In the early twentieth century, the fields of history and archaeology became more professional, while field methods became more systematic and aimed at holistic documentation of artefacts in their cultural context, to learn more about occupation phases and construction history at each site. After the mid-twentieth century, with the establishment of Yambol History Museum, the management of cultural heritage and its investigation became the prerogative of trained museum staff. Artefact

collections were amalgamated and curated in the Museum. Major excavation and survey projects were organised and conducted by teams of professionals and specialists from the Museum, alongside national and international institutions. Architectural and artefactual studies of historic and prehistoric monuments were complemented with scientific methods of palynology, geomorphology, and zooarchaeology, trying to understand the evolution of cultures in southeast Bulgaria in their environmental context, from the first sedentary societies to the present. With increased field activity, the archaeological discipline in Yambol matured, methods became more rigorous, and procedures standardised.

At the end of the twentieth century, political turmoil disrupted research operations of the museum and most activity was centred on the monitoring and protection of archaeological heritage, especially rescue projects driven by the increasingly frequent reports of looting. After the accession of Bulgaria into the European Union, the situation has stabilised. Research and rescue activities resumed in response to new development and infrastructure projects. Over the course of this fieldwork, documentation has become more sophisticated and comprehensive, with digital methods of field documentation gradually replacing paper. Archaeological observations have been complemented by bioarchaeological and zooarchaeological analyses, and extended by geophysical and remote sensing investigations. Born-digital data have facilitated electronic submission of site cards and their management in a centralised national site register.

Notes

1 During this period the Museum had only seven rescue excavations. Ilija Iliev excavated a sanctuary of Thracian Horseman near Dryanovo village (Iliev 1980, 35–7; 2009a, 10). Ivan Krajchev excavated the Mediaeval necropolis near Dobroselets village (Krajchev 1983, 129; 1984, 121; 1985, 276; Iliev 2009a, 10). Five burial mounds were excavated over this period: near Borisovo village (Tancheva-Vasileva 1984, 69–75; Iliev 2009a, 10), near Lyulin village (Getov and Popov 1972, 42–7; Iliev 2009a, 8), near Pchela village (Tancheva-Vasileva 1993, 38–41; Iliev 2009a, 10), near Topolovgrad town (Dimitrova 1980, 215–34), and near Zavoj village (Getov and Popov 1972, 49–51).

2 Georgi Nekhrizov excavated ritual pits from the Late Bronze Age near Gorska Polyana village (Bakardzhiev 1999, 3; 2006a, 108–12; Iliev 2009a, 10). Rumen Mikov excavated sondages at a settlement from the Late Iron Age near Oman village (Bakardzhiev 1999, 4; Iliev 2009a, 10). Valeri Grigorov and Radoslav Vasilev undertook new archaeological excavation at the border trench Erkesiata found to the east of Lyulin village (Grigorov and Vasilev 2007, 161–2; Iliev 2009a, 10). Stefan Bakardzhiev and Akira Takanashi excavated a Thracian burial mound near Gorska Polyana village (Bakardzhiev 1999, 3; Iliev 2009a, 10). Georgi Kitov excavated two Thracian burial mounds near Aleksandrovo village (Bakardzhiev 1999, 2; Iliev 2009a, 10). Georgi Nekhrizov excavated two ancient burial mounds near Lozenets village (Nekhrizov 2001, 63; Iliev 2009a, 10). Stefan Bakardzhiev conducted sondage excavations at an open-air settlement near Lozenets village. Materials found at site dated to the Early Iron Age, Roman and Mediaeval Periods (Iliev 2009a, 10).

3 Viktoria Petrova, Stefan Bakardzhiev, and Ilija Iliev excavated ritual structures from the Late Neolithic near Hadzhidimitrovo village. In the northeast part of the archaeological, Late Iron Age pits were excavated (Petrova 2009, 64; 2010, 54–6; Iliev 2009a, 11; Petrova *et al.* 2011, 60). Stefan Alexandrov and Ilija Iliev excavated a burial mound from the Early Bronze Age between the villages Zimnitsa and Charda (Aleksandrov and Iliev 2010, 113–14; Iliev 2011, 390–1). Stefan Bakardzhiev undertook sondage archaeological excavations on a settlement from the Early Iron Age near Zavoj village (Iliev 2009a, 11; Bakardzhiev 2010, 149–51). Anelia Bozhkova and Aneta Petrova excavated ritual pits from the Early Iron Age near Malenovo village (Bozhkova and Petrova 2009, 153; 2010, 156–8; 2011, 144–5; Iliev 2009a, 11). Ilija Iliev and Stefan Bakardzhiev excavated a Thracian burial mound near Drazhevo village (Iliev 2009a, 11; Iliev and Bakardzhiev 2009b, 283–4). The same team excavated one Thracian burial mound near Kabile village (Bakardzhiev and Iliev 2008, 243–5; Iliev 2009a, 11). Totko Stojanov, Rumen Mikov, and Tanya Dzhanfezova excavated another Thracian burial mound near Kabile village (Stojanov, Mikov and Dzhanfezova 2010, 239–42). Veneta Handzhijska, Konstantin Rabadzhiev and Diyan Yankulov excavated a flat Roman necropolis situated east of the ancient town of Kabyle (Iliev 2009a, 11; Handzhijska and Rabadzhiev 2009, 534–5; Hanzdijska and Yankulov 2010, 422–5). Ivajlo Lozanov and Kristian Hristov excavated an ancient burial mound near Kabile village (Lozanov and Hristov 2009, 530–1; 2010, 419–22). Ivo Cholakov and Natalia Peeva excavated five ancient burial mounds near Charda village (Cholakov and Peeva 2009, 535–7; 2010, 408–10). Andrej Aladzhov, Evgenia Komatarova-Balinova, Elena Vasileva, and Filip Petrunov excavated a Late Antique settlement near Malenovo village (Aladzhov *et al.* 2008, 524–5). Boni Petrunova excavated part of a Mediaeval settlement with necropolis; the archaeological site is situated in the area Trite Mogili between Zavoj and Charda villages (Iliev 2009a, 11; Petrunova 2009, 750–2; Petrunova and Iliev 2010, 616–17). Stefan Aleksandrov, Tanya Hristova, Elena Vasileva, and Stefan Bakardzhiev excavated an Ottoman necropolis near Charda village (Aleksandrov and Hristova 2009, 752–5; Iliev 2009a, 11; Vasileva and Bakardzhiev 2010, 618–20).

4 Todor Valchev and Ilija Iliev carried out sondage archaeological excavation on prehistoric Maleva mound near Veselinovo village (Valchev Iliev and Bakardzhiev 2015, 105–7). Deyan Dichev excavated two dolmens near Golyam Dervent Village (Dichev 2006, 110–12; 2008, 155–6; Iliev 2009, 11). Ilija Iliev and Emil Buzov undertook sondage archaeological excavations on the rock sanctuary near Melnitza village (Iliev and Buzov 2011, 196). Stefan Bakardzhiev undertook sondage archaeological excavations of the Roman settlement near Stroyno village (Bakardzhiev 2007, 238–40; 2008, 471–2; Iliev 2009, 11; Bakardzhiev and Kozarev 2015, 570–2; see also present volume, Chapter 18). Daniela Agre, Deyan Dichev, and Hristo Hristov

conducted a sondage excavation on an ancient settlement near Stroyno village (Agre, Dichev and Hristov 2015, 208–11). Stefan Bakardzhiev carried out a sondage excavation on the ancient town of Dodoparon-Dadopara near Golyam Manastir village (Bakardzhiev 2011, 369–70; see also Chapter 19 this volume). Victoria Petrova conducted an excavation of the southeast and northeast periphery of the archaeological site near Hadzhidimitrovo village that was excavated before construction of the Thrakia Highway (Petrova *et al.* 2014a, 63–5; 2014b, 65–7).

5 Four mounds near Borisovo village (Agre 2009, 279–82; 2012, 218–19; 2013, 164–6; Iliev 2009a, 11), one near Botevo village (Bakardzhiev and Valchev 2015a, 568–9), six near Boyanovo village (Agre 2008b, 235–7; 2010, 251–3; Bakardzhiev 2009, 3–4; Iliev 2009a, 10; 2011, 383–8; Bakardzhiev, Iliev and Rusev 2011, 117; see also present volume, Chapter 17), three near Drazhevo village (Bakardzhiev 2005b, 152–3; 2006b, 124–30; Iliev 2009a, 10), one near Irechekovo village (Bakardzhiev and Iliev 2006, 76–8; Iliev and Bakardzhiev 2009a, 3; Iliev 2009a, 11), one near Karavelovo village (Dichev 2013, 162–4), two near Kirilovo village (Agre, Hristov and Nikolova 2014, 197–200), one mound between Malomirovo and Zlatinitsa villages (Agre 2006b, 64), one near Mogila village (Bakardzhiev 2005a, 81–2; Iliev and Bakardzhiev 2006, 89–96; Iliev 2009a, 10; 2011, 381–3), two near Palauzovo village (Iliev and Bakardzhiev 2008b, 3–4; 2008c, 239–42; Iliev 2009a, 11), one near Popovo village (Agre 2007b, 74–6; Iliev 2009, 11, 388–9), one near Ruzhica village (Agre 2005b, 146–8; Iliev 2009a, 10–11), and two burial mounds near Stroyno village (Hristov 2013, 164; Agre 2015, 211–13).

13

Palaeoecology of the Middle Tundzha Plain

Simon Connor, Andy Herries, and Scott Mooney

Abstract *The rich agricultural and pastoral lands of the Middle Tundzha plain have a long history of human activity. Palaeoecological data from the Straldzha Mire have provided unprecedented information about past environments of the Middle Tundzha River lowlands. This chapter describes the pollen and other environmental evidence, with the aims of contextualising prehistoric settlement patterns, tracing climatic changes, and reconstructing forest evolution, land-use history, and the plant resources available to past human populations.*

Keywords *Forest history; land use; palaeoenvironment; plant resources; Upper Thrace*

13.1 Introduction

The integration of archaeological and palaeoenvironmental approaches has much to offer both disciplines in understanding past human-environment interactions. Human societies have both shaped and been shaped by their environment, just as environments for millennia have been moulded by human activities, creating the cultural landscapes seen across the globe today (Birks *et al.* 1988). In Bulgaria, a country with extensive areas of cultural landscape, integration of archaeology and palaeoenvironmental science has rarely been achieved. Some recent works have begun to redress this disciplinary separation (*e.g.*, Marinova and Thiebault 2008; Marinova *et al.* 2012; Tonkov *et al.* 2014a). Palaeoenvironmental research has been an important facet of Tundzha Regional Archaeology Project (TRAP) activities since the project's inception, with the aim of providing a landscape-scale context for changing settlement patterns, economic activities and cultural practices.

The Middle Tundzha plain is today a productive agricultural and pastoral landscape. Its fertile soils, gentle topography, and amenable climate (Chapter 11) have made this an important area for grain and livestock production since antiquity. The wide distribution of archaeological evidence from the Neolithic to recent times (Chapter 16) attests to changes in population and settlement patterns in prehistoric and historical times. Kabyle, once an important urban and political centre with a commanding outlook over the Middle Tundzha plain (Nankov 2015), would have required significant production areas to sustain its population and trading links to the surrounding region. What kind of landscape supported ancient settlements such as these?

According to geobotanical vegetation reconstructions based on remnant vegetation, soil, and climatic characteristics, the Middle Tundzha plain was almost entirely forested in the past (Bondev 1991). Although forest products were certainly important in the prehistoric economies of the Middle Tundzha plain, it is hard to imagine that the area's varied agricultural produce could have come from a landscape covered by a dense forest canopy. Agriculture in its earliest incarnations in Bulgaria may have been practised in small-scale forest clearings (Marinova and Thiebault 2008), but by the Late Bronze Age there are indications that agriculture and pastoralism were practised in an extensive rather than intensive mode, requiring large forest-free areas (Leshtakov 2009). Clearly, then, there is a mismatch between the reconstructed vegetation and the kind of landscape that existed in prehistory. This raises a number of questions. Was the landscape of the Middle Tundzha plain previously covered by oak forests? Or have the surviving forest remnants somehow skewed our view of the past vegetation? If forests did cover the Middle Tundzha plain, what was the timing and cause of their removal? Was forest removal a rapid or incremental process?

Palaeoenvironmental research has the potential to shed light on these questions. In this chapter, we describe

the context for palaeoenvironmental research on the Middle Tundzha plain, followed by a section detailing the Straldzha Mire, our key research site. The chapter also includes the results that have come to light from pollen, charcoal, and mineral magnetic analyses of dated sediment sequences from this site. Finally, the landscape and plant resources of the Middle Tundzha plain are reconstructed, providing a context for the archaeological findings described in other chapters.

13.2 Research context

As mentioned in Chapter 4, palaeoenvironmental research in Bulgaria has hitherto tended to focus on the highlands, especially the formerly glaciated areas of the Rila and Pirin Mountains, and the Black Sea lowlands. The few pollen records that exist from the Upper Thracian Plain are discontinuous (Filipovitch and Stojanova 1990; Magyari *et al.* 2008). Pollen records from the mountains have shown the development of high altitude vegetation belts through the Late Pleistocene and Holocene. These developments have tracked climatic changes as tree lines moved in response to temperature variations (Bozilova and Tonkov 2000; Stefanova and Ammann 2003). The coastal records have shown quite a different vegetation trajectory, indicating that the moist Euxine forests that characterise the Black Sea's southern coast have existed since the Early to Mid-Holocene (Bozilova and Beug 1992). Drier parts of the Bulgarian coast were naturally home to diverse forest steppe vegetation types (Filipova 1985; Tonkov *et al.* 2011). Changes in sea level and coastal sedimentation affected the vegetation at some of the coastal sites, while others indicate relative stability (Bozilova and Beug 1992; 1994). These coastal records are from lagoons that formed after sea levels rose during the Early Holocene, so sediments relevant to that earlier period are not always recorded. Pollen records from the Black Sea sediments embrace the Early Holocene, indicating the expansion of oak forests (Shumilovskikh *et al.* 2012; Filipova-Marinova *et al.* 2013). Yet these marine pollen records are difficult to interpret because they contain pollen from a very large and ill-defined catchment, and pollen deposition is influenced by circulation currents within the Black Sea itself. For answering questions relevant to the Middle Tundzha plain, it was necessary to find sediments of a suitable age in closer proximity to the archaeological sites.

13.3 Straldzha Mire

The Straldzha Mire (also Straldzhansko Blato or Atolovo Mire) is located in a poorly drained tectonic depression at the southern foot of the Stara Planina, one of many former wetlands on the Middle Tundzha plain (Atanassova and Marinova 2005). The depression is underlain by Upper Cretaceous sedimentary rocks and filled with Neogene alluvial sediments (Petrova, Savov and Filipov 1995). The Mire was formerly the largest inland water body in Bulgaria but was drained in the 1930s for agricultural production associated with refugee resettlement projects (Stoyneva and Michev 2007). Very little of the original wetland ecosystem remains, and a large quarry has been dug into the centre of the Mire to extract clay for the nearby tile factory. Quarrying has exposed a sequence of sediments – peaty silt near the surface and silty marl at greater depth – that proved to be suitable for palaeoenvironmental analyses, containing fossil pollen, charred particles, mineral magnetic signatures, and organic material for radiometric dating.

Unbeknown to the TRAP team, a nearby area of the Straldzha Mire was investigated separately by researchers from Sofia University's Botany Department, with results published shortly after our field campaign in 2008 (Tonkov *et al.* 2008a; Tonkov, Bozilova and Jungner 2009). The Sofia University team produced a pollen diagram from a 290 cm core covering the Late Holocene (beginning 2284–1917 cal. BC). The pollen record has three zones, each indicating a distinct period in the area's vegetation history. The first zone demonstrates that the vegetation around Straldzha Mire was already deforested by the late third millennium BC, having a prevalence of grass and herb pollen, including indicators of anthropogenic activity (*e.g.*, *Cerealia*-type, *Rumex*, and *Xanthium*; see Marinova *et al.* 2012). The second zone (880 cal. BC–cal. AD 620) indicates further expansion of herbaceous species, particularly the salt-tolerant Amaranthaceae (syn. Chenopodiaceae). Only the third and most recent zone (cal. AD 620 to the present) shows an increase in tree pollen such as *Quercus* and *Pinus* (Tonkov *et al.* 2008a; Tonkov, Bozilova and Jungner 2009).

TRAP team members obtained a longer sediment sequence (520 cm) from the excavated quarry walls, which were cleaned carefully of surface contamination prior to sampling. To ensure the reproducibility of results, additional sediment cores were obtained using a soil auger from three locations evenly spaced across the longest axis of the Mire. Fossil pollen and charred particles were extracted from the sediment samples using standard techniques, providing information on the vegetation and fire history of the Straldzha area. Mineral magnetic measurements were also performed using a magnetic susceptibility meter and a variable field translation balance. A full description of the methods is given in Connor et al. (2013, 202–3) and Chapter 4 in this volume.

13.3.1 Palaeoenvironmental results

The Straldzha Mire sequence proved to be one of the longer Quaternary records from the Balkans, extending back to approximately 35,000 cal. BC. Radiometric dating indicated that the sedimentation rate had varied substantially through that time, with very slow sedimentation rates (and a possible hiatus) during the Late Glacial (ca. 14,000–9,500 cal. BC), followed by rapid deposition through the Early Holocene (Connor *et al.* 2013). This was a time of major climatic change in

the region and it is probable that these changes affected sedimentation rates. The environmental history from the site is summarised in several pollen assemblage zones, each of which is characterised by a relatively homogenous pollen composition (Fig. 13.1).

The first such zone lasted from 35,550–15,950 cal. BC, during the last glacial period. Its pollen assemblage is made up of a significant amount of *Artemisia* (wormwood or sagebrush) pollen, indicative of dry conditions and analogous to the cold steppes found in the highlands of Central Asia in the present day. Poaceae (grass) and *Polygonum aviculare* (knotgrass) pollen were also abundant and indicative of almost treeless vegetation. The only major tree pollen encountered was that of *Pinus* (pine), which probably travelled from distant pine populations. Small amounts of *Celtis* (hackberry), *Betula* (birch), and *Juniperus* (juniper) pollen suggest that these aridity-adapted trees were present in small numbers at this

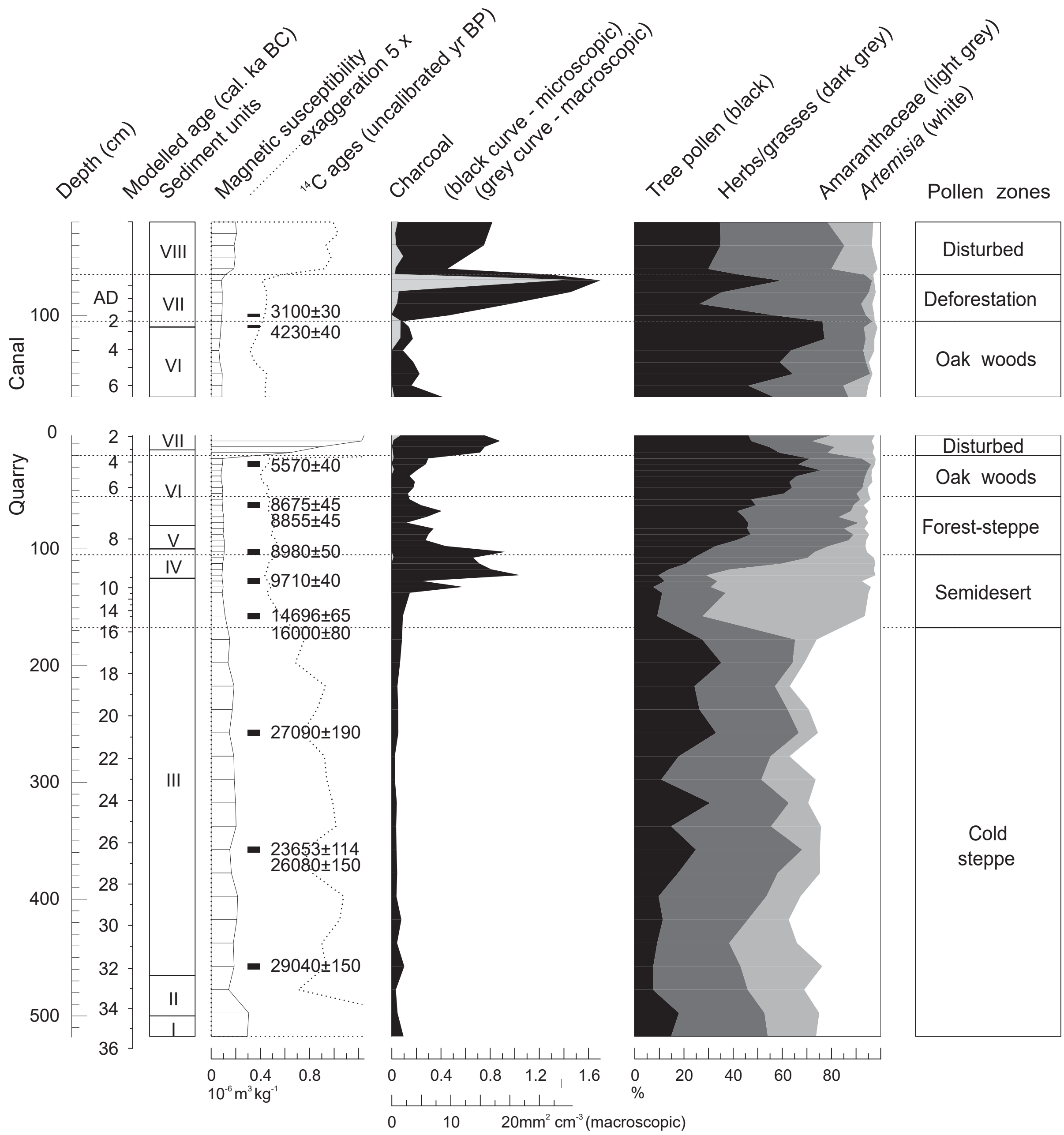


Figure 13.1 Summary of the main palaeoenvironmental results for the entire Straldzha Mire record presented stratigraphically (i.e. with depth as the y-axis). The graph shows, from left to right, modelled age of the sediment (in 1,000s of calendar years BC), sediment lithological units (see Connor et al. 2013), magnetic susceptibility (with higher values often indicative of erosion), positions of radiocarbon dates, microscopic and macroscopic charcoal (representing regional and local fires, respectively), main pollen groups represented, and the pollen assemblage zones mentioned in the text.

time, in all probability hugging closely to water bodies such as the Straldzha Mire itself.

After 16,000 cal. BC, Amaranthaceae (goosefoot/glasswort) pollen became extremely abundant. This signalled the retreat of cold steppe and its replacement with arid, salt tolerant vegetation. Small groups of trees (*i.e.* hackberry, oak, birch, juniper, willow, and alder) may have existed in moist, sheltered locations, as suggested by macrofossil analyses from wetland sediments at Ezero (near Nova Zagora), dated to around 13,500 cal. BC (Magyari *et al.* 2008). From these small tree populations, pollen data at the Straldzha Mire indicate the initial signs of tree advance in this zone, as oak, elm, and other trees start to increase from the beginning of the Holocene (~9750 cal. BC). Fires apparently increased at this time, probably as a consequence of the dry, seasonal climate and increasing biomass, or perhaps through landscape management by hunter-gatherer populations.

The increasing role of trees in the landscape of the Middle Tundzha plain continued through the next zone (8,350–6,950 cal. BC), replacing arid steppes and semi-deserts with scrub and open woodland vegetation. This occurred as the climate became wetter and probably warmer as well. However, there is no indication of widespread dense forests during this phase, at least on the plains around Straldzha Mire. Diverse herbaceous pollen and the presence of *Pistacia* (terebinth) suggest that trees only partially covered the landscape. The dry climate that prevented this forest-steppe from turning into a woodland may have also played its part in delaying the spread of agriculture across the Upper Thracian Plain (Connor *et al.* 2013).

Denser oak woodlands arrived after 7000 cal. BC. These *Quercus*-dominated woods were mixed with *Ulmus* (elm), *Tilia* (lime), and *Corylus* (hazel). With high levels of tree pollen and low levels of Amaranthaceae, this was undoubtedly a relatively wet climatic phase. Forest fires were rare, indicated by low charred particle concentrations. Low magnetic susceptibility values and the homogeneous marl sediments of this phase suggest a stable lake system, with relatively little erosion occurring on the surrounding hillsides.

Conditions changed quite remarkably around 2000 cal. BC (approximate age, see below). Oak, elm, and hazel pollen all experienced major declines, while grass pollen became very abundant. Fires accompanied this change and give a hint as to the cause of forest decline. Some of these fires were local, as indicated by macroscopic charcoal pieces in the sediment. Fungal spores associated with grazing herbivores, as well as magnetic indicators of soil erosion, also increase at this time. While it seems likely that human activities led to the decline of forests on the Middle Tundzha plain (Tonkov, Bozilova and Jungner 2009), it is difficult to discount the possibility that climatic change may have been a contributing factor (Dennell and Webley 1975). Pollen records from the highest elevations of the Rila, Pirin, and Rhodopes Mountains, far from any direct Bronze Age human impact, give evidence that the climate was cooling at this time (Tonkov and Marinova 2005; Tonkov *et al.* 2008b; 2014b; Marinova *et al.* 2012). Cooler temperatures may have placed stress on thermophilous oak woodlands, exposing them to herbivorous browsers and pathogens. In any case, this and the previous record from Straldzha Mire provide convincing evidence that the Middle Tundzha plain's forest cover disintegrated in the third or second millennium BC. While there may have been some minor readvances of trees in more recent times, nothing resembling complete forest recovery is recorded (Tonkov, Bozilova and Jungner 2009; Connor *et al.* 2013).

13.4 Prehistoric forests

Evidence from the Straldzha Mire allows us to address the questions asked earlier. Each question is dealt with in the sections below.

Was the landscape of the Middle Tundzha plain previously covered by oak forests? The evidence suggests that this is certainly the case, though only during a specific period of the Mid-Holocene characterised by relatively wet and warm climatic conditions. Different parts of the landscape would have varied in terms of their forest composition, with poorly drained alluvial soils more likely to support other deciduous species such as elm, ash, willow, and alder, all of which are attested in the pollen evidence (*Ulmus, Fraxinus, Salix*, and *Alnus*) at levels of abundance high enough to suggest nearby populations (Lisitsyna, Giesecke and Hicks 2011). Beech (*Fagus*) and pine (*Pinus*) are unlikely to have occurred on the plains and their pollen probably derives from forests on the slopes of the Stara Planina. Pine pollen, especially, is very mobile and easily carried over long distances by the wind (Lisitsyna, Giesecke and Hicks 2011).

Have the surviving forest remnants somehow skewed our view of the past vegetation? Reconstruction based on remnant vegetation (Bondev 1991) matches very well with the pollen based vegetation for the period of maximum oak forest extent (*i.e.* 7,000–2,000 cal. BC). This match suggests that the remnants are valuable sources of information on the Mid-Holocene forests, the specific composition of which is difficult to determine from pollen analysis alone. In this regard, the reconstruction of Bondev (1991) is a useful baseline for Mid-Holocene vegetation, at least for the area surrounding the Straldzha Mire.

If forests did cover the Middle Tundzha plain, what was the timing of their removal? Forest decline in the Straldzha Mire record dates to approximately 2,000 cal. BC. It is important to note that this is an approximate age and the exact timing of deforestation occurs somewhere between 2,911 and 1,297 cal. BC, assuming the relevant radiometric dates in the canal core are accurate and uncontaminated. The timing of deforestation can be refined with reference

to the previous Straldzha and Ezero records, which indicate the Thracian Plain's landscape was 'largely open' at ca. 1,200 cal. BC around Ezero (Chapman, Magyari and Gaydarska 2009, 164) and 'woodland was already heavily destroyed by the local population from the Bronze Age' around Straldzha by 2,284–1,917 cal. BC (Tonkov, Bozilova and Jungner 2009, 237). The latter allows us to narrow down the onset of forest decline to between 2,911 and 1,917 cal. BC, *i.e.* the Early to Middle Bronze Age.

Geomorphic evidence from the Nova Zagora area shows a major erosion event occurred between the Early and Late Bronze Ages (Dennell and Webley 1975, 101), consistent with the timing of deforestation on the Middle Tundzha plain and suggestive of widespread landscape instability. There are strong suggestions that human activities were involved in the process of deforestation, yet the timing of forest loss coincides with a period of regional climatic change (Marinova *et al.* 2012; Tonkov *et al.* 2014b) that may have contributed to woodland decline. Whether the removal of forests was a deliberate process cannot be determined from the available data. It is likely that several factors – climate change, soil development, felling, burning, and land-use change – interacted to bring about landscape change on a broad scale.

Was forest removal a rapid or incremental process? Initial forest decline was apparently rapid and the loss of the plain's closed forest ecosystems irreversible under a regime of burning, grazing, and felling. Although there are some short-lived increases in tree pollen after deforestation, their impact on a landscape scale was probably very minor. Essentially, the Middle Tundzha plain's landscape today carries a strong legacy of prehistoric deforestation, overlain by more recent changes in land use, such as Communist era plantations, dams, and wetland reclamation projects.

13.5 Prehistoric vegetation and land use

The paleoclimatic significance of the Straldzha record has been discussed at length previously (Connor *et al.* 2013). Here it is relevant to focus on some details of the Holocene part of the record that may help to better understand the landscape and plant resources available to prehistoric populations at different times in the past. This discussion is based on the two pollen diagrams from the Straldzha Mire (Fig. 13.2). It should be remembered that the dating of these diagrams still leaves considerable room for uncertainty. This is especially acute for the quarry section, which has only a single radiometric date for the Mid-Late Holocene. The canal core has two dates and is matched biostratigraphically with the well-dated parts of the quarry record. Therefore, the canal core provides the primary focus of this discussion. Interpretation of pollen records in terms of vegetation density is problematic and the subject of some of the most vigorous debates on Europe's Holocene vegetation history (Vera 2000; Theuerkauf *et al.* 2014). Models have been developed to translate pollen data into landscape openness in various parts of Europe (Hellmann *et al.* 2008; Feurdean *et al.* 2015), but in Bulgaria there is still a lack of the high-quality calibration data required to implement these models with accuracy. Hence the results from Straldzha Mire are discussed in qualitative terms.

Neolithic landscapes around Straldzha Mire were largely forested. This is not to say, however, that these were impenetrable jungles like the 'longoz' forests that currently grow along parts of the Bulgarian Black Sea coast. Nor were these redolent of the forest steppe vegetation encountered around areas like Lake Shabla (Filipova 1985). Compositionally the Neolithic forests around Straldzha Mire fell somewhere between these extremes, as shown by statistical analysis of pollen assemblages (Connor *et al.* 2013, 206). An appropriate term could be 'woodlands'. The persistence of *Juniperus* (juniper), *Pistacia* (terebinth), *Sorbus,* and *Rosa* (rosaceous shrubs) indicates a relatively open type of woodland, one which harboured a grassy ground layer. Herbs associated with open meadows and forest clearings, such as *Centaurea nigra, Cerastium, Thalictrum, Galium, Sanguisorba minor*, and *Trollius europaeus*, were relatively common around Straldzha Mire during the Neolithic (Table 13.1).

There is also evidence of human activities in the landscape, well before the Bronze Age deforestation phase. Cultivated cereals, such as *Triticum* (wheat) and *Secale* (rye) were present, along with agricultural and pasture weeds, including *Urtica* (nettle), *Cannabis* (hemp), and *Rumex* (sorrel). It is known from archaeobotanical data that the Neolithic populations of Upper Thrace cultivated *Triticum monococcum* (einkorn), *T. dicoccum* (emmer), *Hordeum vulgare* (barley), *Lens culinaris* (lentil), *Pisum sativum* (pea), *Lathyrus sativus*/*cicera* (grass/red pea), *Vicia ervilia* (vetch), *Cicer arietinum* (chickpea), and *Linum* (flax). Domestic crops were supplemented with wild fruits such as *Cornus mas* (cornelian cherry), *Vitis vinifera* ssp. *sylvestris* (wild grape), *Corylus avellana* (hazelnut), *Pistacia terebinthus* (terebinth), and various rosaceous types: wild strawberry, plum, pear, apple, and elderberry (Marinova 2007). Alongside agriculture and foraging, stockbreeding was important. *Pteridium* (bracken), a fern associated with grazing and open areas, occurred in proximity to Straldzha Mire during Neolithic times, along with fungal spores indicative of grazing (*Sordaria* and *Podospora*). It is not possible to say whether these grazing animals were wild or domestic. Very high levels of green algae (*Pediastrum* and *Botryococcus*) in the sediments suggest that Straldzha Mire was a nutrient-enriched, shallow lake during this period, possibly with strong summer evaporation. Wetland vegetation (*i.e.* sedges and rushes) was poorly developed, indicating a water surface that was open and may have even been navigable by small fishing craft.

During the Chalcolithic, oak forests continued to expand in the Straldzha Mire vicinity. In all major respects

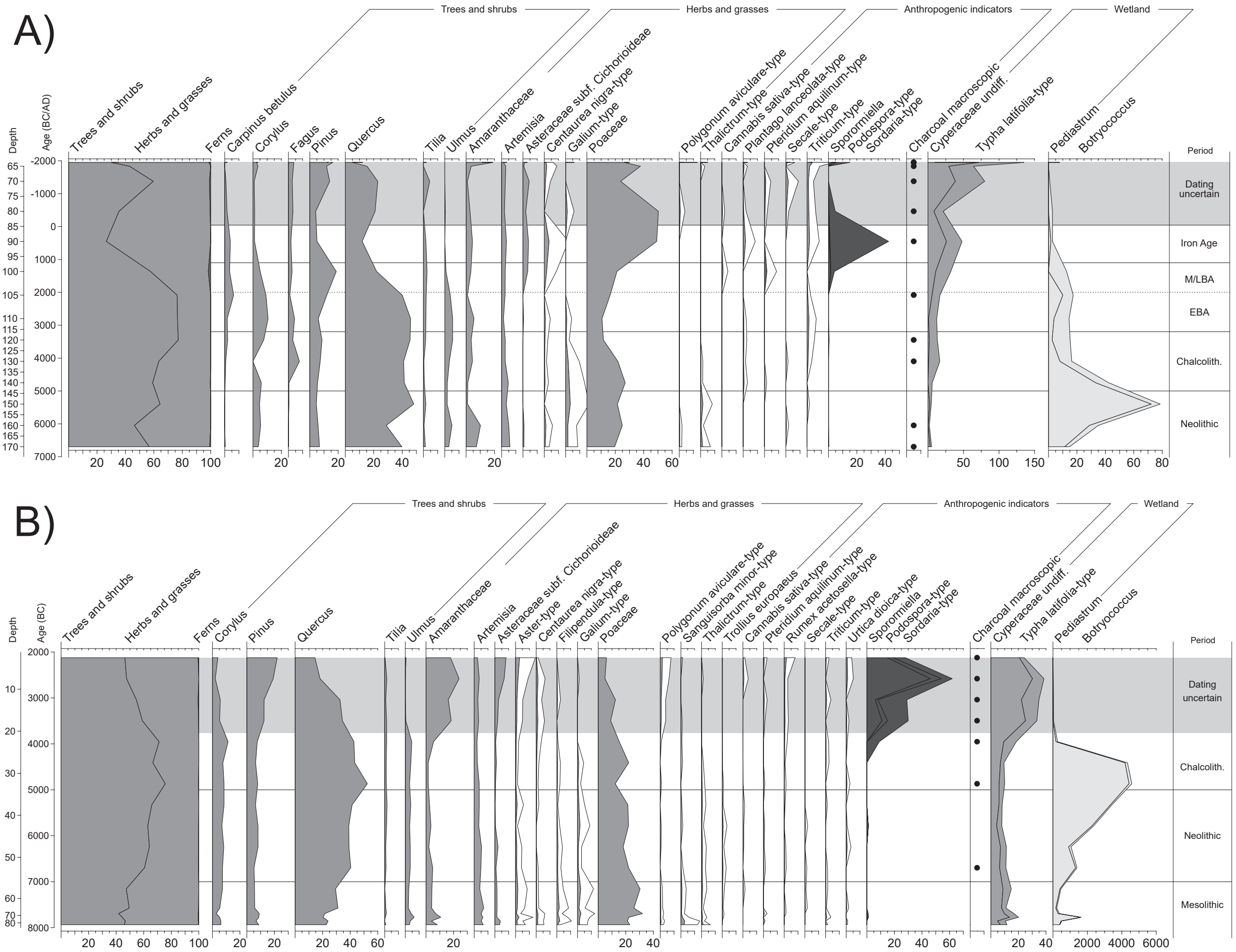


Figure 13.2 Diagrams showing only the post-glacial (Holocene) sections of the pollen record from Straldzha Mire: A) the canal record; B) the quarry record. Horizontal lines mark the approximate boundaries between archaeological periods. Note the intervals where dating uncertainty precludes their assignment to a particular period.

these forests were identical to their Neolithic predecessors, retaining a grassy understorey and a diversity of meadow species. *Ulmus* (elm) and *Quercus* (oak) remained the most important canopy trees. Like the previous period, there are indications of human activity, such as cereal and weed pollen. The environment of the Chalcolithic was changing, however, on both local and regional scales. Locally, the Straldzha Mire began to change from a lake to a wetland, as *Typha* (rush) and Cyperaceae (sedges) gradually encroached on the area of open water. Regionally the forests on the slopes of the Stara Planina were changing, as *Fagus* (beech) and *Carpinus betulus* (hornbeam) forests extended their range. Together, these changes in the lake and regional environments suggest a shift in climatic conditions, perhaps toward slightly cooler and moister summers than previously.

In the Early Bronze Age, oak forests in the Straldzha area reached their maximum Holocene density. Low values of Poaceae (grass) pollen and the prominent decline of meadow herbs such as *Galium* and *Thalictrum* indicate that forest had encroached upon some of the openings that had persisted through the Neolithic and Chalcolithic. This kind of vegetation may have been more difficult to traverse than previously, presenting a challenge to agricultural, pastoral, and trade activities. Curiously, *Triticum* (wheat) increases in this period, accompanied by *Agrostemma githago*, a typical weed of grain crops. This suggests that Early Bronze Age people were practising agriculture within an increasingly forested landscape, perhaps utilising small clearings for the purpose. The surrounding oak-elm forests would have provided many resources, including timber, fruits, and nuts such as *Corylus* (hazel), foraging areas for pigs, and habitat for game.

For reasons that are still obscure, the relationship between humans and these forests changed during the Middle and Late Bronze Age, as forests were removed from the Straldzha landscape and presumably from much of the Thracian Plain. The nature of the forest decline provides an insight into how these forests were destroyed. *Ulmus* (elm) declines most rapidly and it appears this tree was entirely removed from the plains. Similarly, rapid elm declines are seen in northwest Europe over the period 4,700–3,200 BC (Nielsen *et al.* 2012). *Quercus* (oak) declines rapidly, but less so than elm, and at least

Table 13.1 List of pollen types identified in the Straldzha Mire sediments, grouped by habitat, with occurrences indicated for the Neolithic (NL), Chalcolithic (CH), Early Bronze Age (EBA), Middle to Late Bronze Age (LBA) and Iron Age (IA)

Trees of lowland woods					
Quercus	NL	CH	EBA	LBA	IA
Tilia	NL	CH	EBA	LBA	IA
Acer campestre-t.	NL				
Ulmus	NL	CH	EBA	LBA	IA
Trees of mountain forests					
Carpinus betulus		CH	EBA	LBA	IA
Fagus		CH	EBA	LBA	IA
Pinus			EBA	LBA	
Abies			EBA	LBA	IA
Shrubs and lianas of oak woodland					
Hedera	NL	CH			
Corylus	NL	CH	EBA	LBA	IA
Crataegus-t.	NL	CH			
Viscum	NL	CH			
Vitis	NL	CH			
Shrubs of woodland edges and scrub					
Sambucus nigra-t.	NL				
Pistacia	NL	CH			
Ostrya	NL				
Juniperus		CH			
Prunus spinosa-t.		CH			
Rosa-t.		CH			
Rubus-t.	NL	CH			
Sorbus-t.	NL	CH	EBA		
Herbs of steppes, meadows and woodland edges					
Amaranthaceae	NL	CH	EBA	LBA	IA
Allium-t.	NL				
Apiaceae undiff.	NL	CH			
Pimpinella-t.	NL				
Bupleurum-t.	NL				
Anthriscus-t.		CH			
Eryngium-t.		CH			
Artemisia	NL	CH	EBA	LBA	IA
Asteraceae Cichorioideae	NL	CH	EBA	LBA	IA
Anthemis-t.	NL	CH	EBA		IA
Aster-t.	NL	CH	EBA		IA
Scorzonera humilis	NL	CH			
Sonchus-t.	NL				
Arctium-t.	NL				
Carduus-t.	NL	CH			
Cirsium-t.	NL	CH	EBA		IA
Centaurea nigra-t.	NL	CH	EBA	LBA	IA
Centaurea solstitialis-t.		CH			
Centaurea scabiosa-t.		CH			

Table 13.1

Dipsacus-t.	NL		EBA		
Valeriana officinalis-t.	NL			LBA	
Caryophyllaceae undiff.	NL	CH			
Cerastium-t.	NL	CH		LBA	
Gypsophila-t.	NL	CH			
Silene dioica-t.	NL				
Stellaria holostea			EBA		
Convovulaceae undiff.		CH		LBA	
Fabaceae undiff.	NL	CH			
Trifolium repens-t.	NL	CH			
Geranium		CH			
Hypericum perforatum-t.	NL	CH			
Mentha-t.	NL	CH			
Lamiaceae undiff.	NL	CH	EBA	LBA	
Scutellaria-t.		CH			
Teucrium-t.	NL			LBA	
Liliaceae undiff.	NL	CH			
Lilium martagon-t.	NL				
Malva				LBA	
Rhinanthus-t.	NL				
Digitalis purpurea-t.	NL				
Veronica-t.	NL				
Poaceae	NL	CH	EBA	LBA	IA
Polygonum aviculare-t.	NL	CH			
Polygonum bistorta-t.	NL	CH			
Lysimachia vulgaris-t.	NL				
Primula farinosa-t.		CH			
Thalictrum-t.	NL	CH			
Ranunculus	NL	CH	EBA		IA
Trollius europaeus	NL	CH			
Adonis aestivalis		CH			
Rosaceae herbs undiff.	NL	CH			
Potentilla-t.		CH			
Filipendula-t.	NL	CH	EBA	LBA	IA
Sanguisorba minor-t.	NL	CH			
Alchemilla-t.		CH			
Agrimonia eupatoria	NL				
Galium-t.	NL	CH	EBA		
Saxifraga stellaris-t.	NL	CH			
Herbs often associated with human activity					
Cannabis sativa-t.	NL			LBA	
Humulus lupulus-t.		CH			
Agrostemma githago			EBA	LBA	
Pteridium aquilinum	NL	CH		LBA	
Trifolium pratense-t.	NL				
Plantago lanceolata-t.		CH	EBA		IA

Table 13.1 List of pollen types identified in the Straldzha Mire sediments, grouped by habitat, with occurrences indicated for the Neolithic (NL), Chalcolithic (CH), Early Bronze Age (EBA), Middle to Late Bronze Age (LBA) and Iron Age (IA)

Plantago major-t.		CH			
Plantago maritima-t.	NL				IA
Triticum-t.	NL	CH	EBA		IA
Secale-t.	NL	CH			
Rumex acetosella-t.	NL	CH			
Urtica dioica-t.	NL	CH			
Wet meadow herbs					
Peucedanum palustre-t.	NL	CH		LBA	IA
Chaerophyllum hirsutum-t.	NL	CH			
Sinapis-t.	NL	CH	EBA	LBA	IA
Hornungia-t.	NL	CH		LBA	IA
Polypodiaceae undiff.	NL	CH	EBA	LBA	IA
Wetland and aquatic					
Alisma					IA
Lemna	NL				
Cyperaceae undiff.	NL	CH	EBA	LBA	IA
Equisetum				LBA	
Myriophyllum spicatum-t.	NL	CH	EBA	LBA	IA
Iris pseudacorus-t.		CH		LBA	
Utricularia			EBA		
Nymphaea alba-t.		CH	EBA	LBA	
Potamogeton undiff.	NL	CH	EBA	LBA	IA
Ruppia maritima-t.	NL	CH			
Salix	NL	CH	EBA		
Salvinia				LBA	IA
Sphagnum	NL	CH			
Sparganium erectum-t.		CH			IA
Typha latifolia-t.	NL	CH	EBA	LBA	IA

The suggested habitat groups are not exclusive and many individual pollen types would comfortably fit under several of the headings. Ordering of types within categories is alphabetically by botanical family name (not shown). The level of taxonomic precision for each type is indicated the way its name is expressed: '-t.' (type) means that the pollen type represents a number of species similar to the one indicated; where '-t.' is missing, the pollen directly relates to a single species or genus in the study area; 'undiff.' (undifferentiated) pollen includes grains that could not be assigned to a more precise category

some oak trees remained on the plains after deforestation. *Corylus* (hazel) and *Tilia* (lime) decline more gradually. This pattern could result from the removal of the forest canopy or use by people, allowing more prolific flowering. Other trees, such as *Fagus* (beech), *Carpinus betulus* (hornbeam), and *Pinus* (pine), did not decline appreciably during deforestation because these trees were almost certainly growing on the slopes of the Stara Planina, which were evidently not targeted by Middle–Late Bronze Age forest clearing. It is striking that the heavy soils of the plains and lowlands, which despite their fertility remain difficult to work nowadays with mechanised agricultural equipment, were developed so early. Yet, judging from the pollen evidence, grain agriculture may not have been the main impetus for clearing. Pollen indicators of grain agriculture, although present, are subsidiary to indicators of grazing, specifically fungal spores of *Sporormiella* and *Sordaria*. The decline of forests on the Middle Tundzha plain may be linked to changing social and economic practices, especially the increasing importance of stock breeding, as well as a rising demand for fuel to feed the development of metallurgy (Leshtakov 2009).

During the Iron Age, agricultural and pastoral development continued on the plains around Straldzha Mire. Rising *Triticum* (wheat) pollen values, with increases in *Plantago* (plantain) and fungal spores indicative of grazing, point to a landscape devoted to grain cultivation and stock breeding. Archaeobotanical analysis of the contents of Iron Age storage pits from nearby archaeological sites yielded an abundance of

domesticated cereals: *Triticum aestivum/durum* (common/durum wheat), *T. monococcum* (einkorn), *T. dicoccum* (emmer), *Hordeum vulgare* var. *vulgare* (barley), and some *Panicum miliaceum* (millet), along with weedy species (Tonkov *et al.* 2008a). These demonstrate that winter sowing, a feature of agriculture on the Middle Tundzha plain today, was well established by the first millennium BC (Tonkov *et al.* 2008a). Forest areas were progressively pushed back, with species such as *Carpinus betulus* (hornbeam), *Corylus* (hazel), and *Tilia* (lime) registering decreases around Straldzha Mire. The increase in agro-pastoral exploitation inferred from the Straldzha pollen record matches an increase in the distribution of settlements on the plains (Chapter 14), suggesting a substantial, yet scattered, human population. Iron Age visitors to the Middle Tundzha plain may have looked upon vegetation with a very similar aspect to the present one – extensive fields and pastures, with patches of forest on stony or sloping ground and along stream sides (Fig. 13.3). Even the now-ubiquitous walnut trees may have been present at this stage (Marinova *et al.* 2012).

Following the Iron Age, the dating of the Straldzha Mire record becomes much less certain and there is a danger of incorrectly attributing changes to specific archaeological periods based on the adopted chronology. Despite this uncertainty, the evidence does show that forests never returned to the Middle Tundzha plain in any form that resembled their Neolithic–Early Bronze Age density or composition. The lands around the Straldzha Mire have remained essentially open – a rich cultural landscape of pastures, fields, and woodland remnants – through to the present day. The Mire itself, however, has changed quite significantly in recent millennia. Areas of open water were overgrown by reed beds, rushes, and sedges, as well as copses of willows (*Salix*) and alders (*Alnus*) in some parts. Prior to artificial drainage in the 1930s, the wetland must have been a diverse and productive ecosystem. Even recently, the Mire is recorded as supporting endangered plant populations and breeding populations of at least 13 water bird species (Stoyneva and Michev 2007).

A further insight into the prehistoric landscape around Straldzha Mire can be gained using palynological

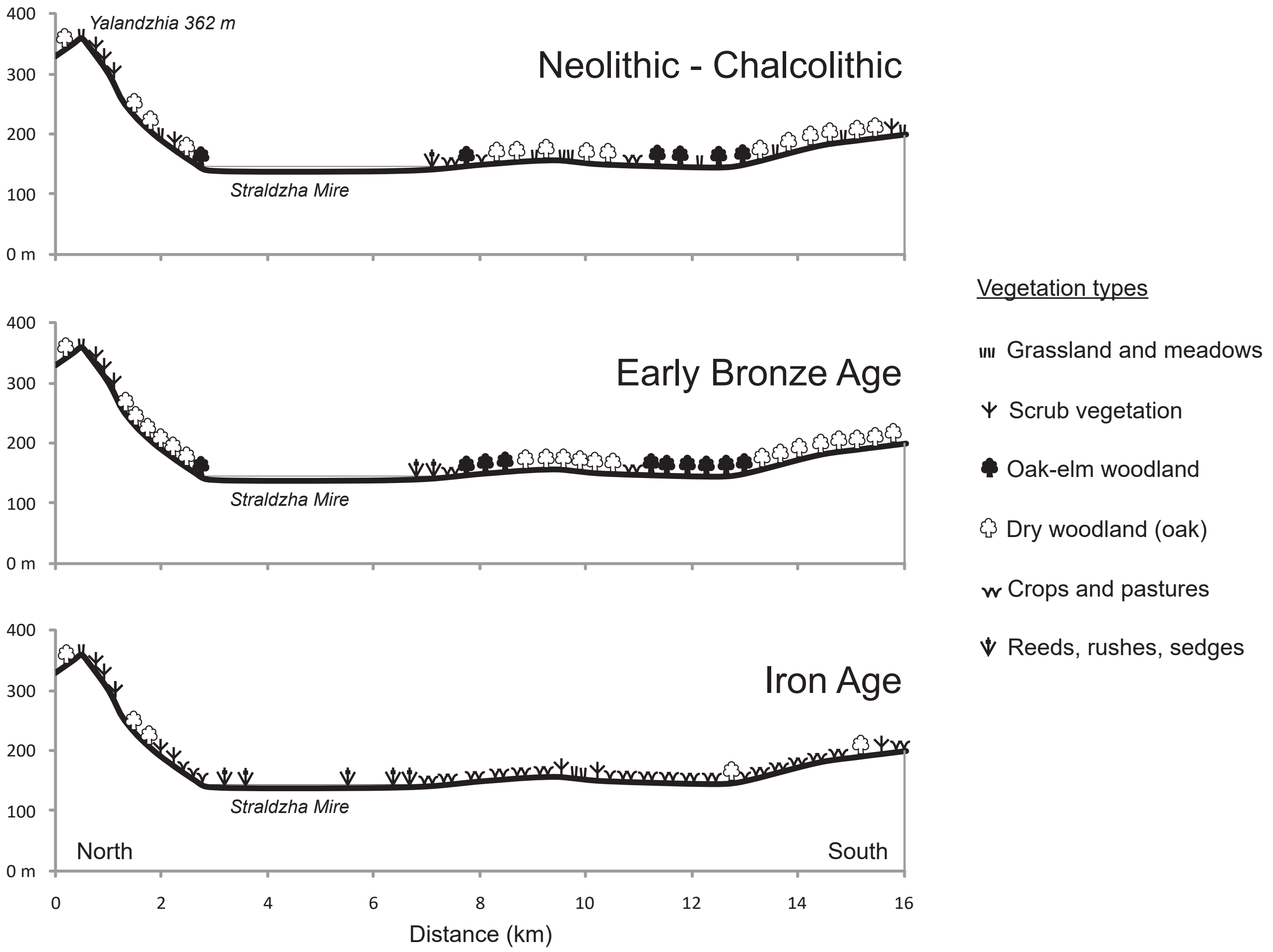


Figure 13.3 Hypothetical reconstruction of main prehistoric vegetation types along a north-south transect from Mt Yalandzhia north of Straldzha Mire (foothills of the Stara Planina) to the area south of Malenovo town, showing changes in vegetation connected with Early Bronze Age woodland expansion and later deforestation (see text).

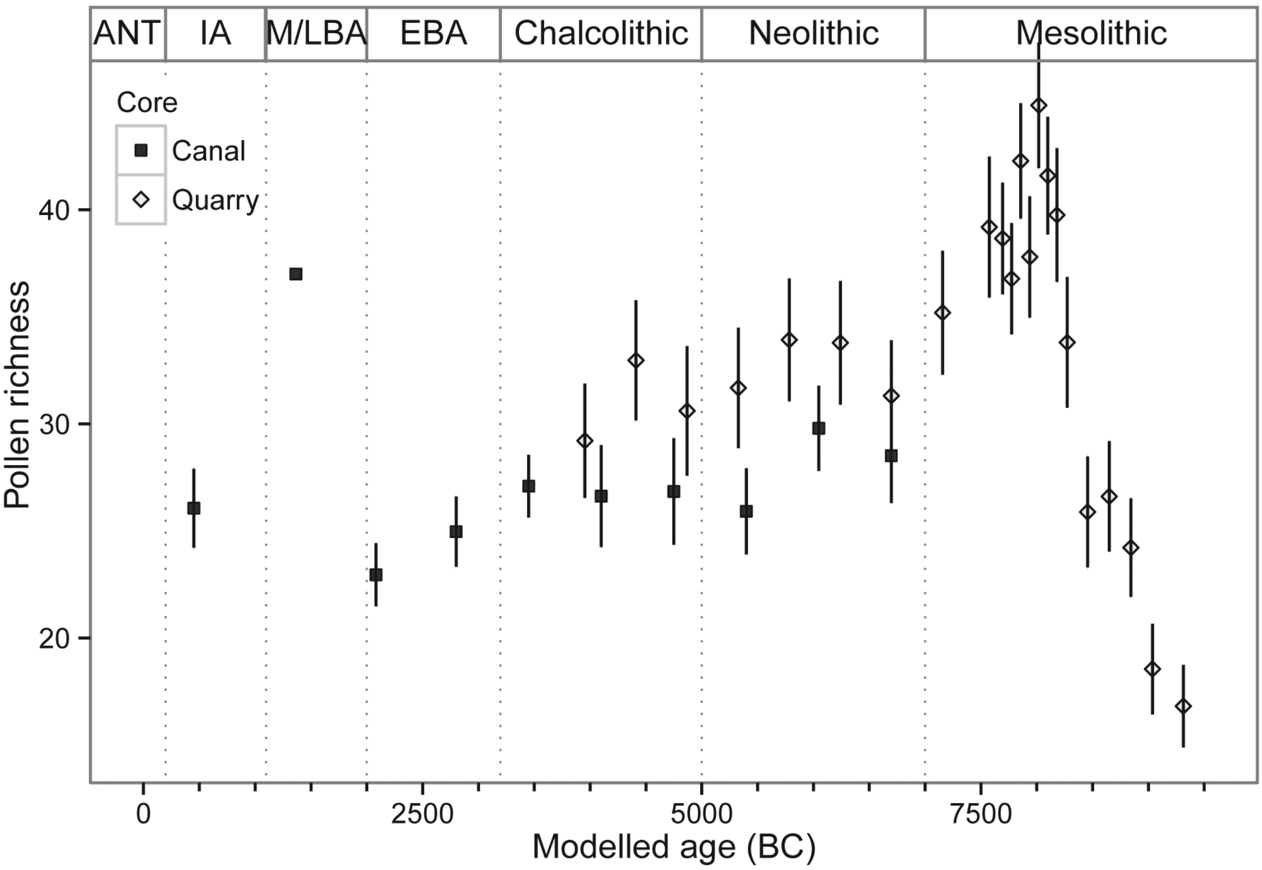


Figure 13.4 Changes in pollen diversity over time at Straldzha Mire, showing high diversity in the Mesolithic and Late Bronze Age and declining diversity in all other periods. Diversity was estimated using the rarefaction technique (see text) and results are plotted with 95% confidence intervals.

rarefaction analysis. This technique provides an estimate of the diversity or richness of the various pollen assemblages, standardised to account for differences in the total number of pollen identified from sample to sample.

Pollen diversity is a complex subject and its relationship to the diversity of plant species in the surroundings is often difficult to determine. Nevertheless, it is regarded as an important measure of past biodiversity (Giesecke, Ammann, and Brande 2014, 217–19). In the case of Straldzha Mire, the results show an interesting long-term trend (Fig. 13.4). Pollen diversity increased rapidly at the beginning of the Holocene, peaking during the Mesolithic. Thereafter, pollen diversity begins to fall away, a trend that is particularly apparent during the Early Bronze Age, the period of maximum forest coverage. Middle–Late Bronze Age deforestation is seen as a peak in pollen diversity as a variety of new habitats was created. However, this variety was short-lived and gave way to much lower diversity in the Iron Age. These results hint at the extent to which human societies can affect biodiversity on a large scale. Questions also arise about the interactions between ecological and cultural development. It is possible that in the diverse landscapes of the Mesolithic, demands for food, medicine and shelter could have been met within a relatively small area. As the landscape became increasingly homogeneous and forested, especially into the Bronze Age, obtaining the same diversity of plant resources may have required longer-distance travel and an increasing reliance on trade, neither of which would have been facilitated by an increasingly dense forest landscape. Did these factors contribute to the forest's eventual demise? Or did new cultural and economic interests drive deforestation?

Many things cannot be determined from pollen analysis alone. As Chapman, Magyari, and Gaydarska (2009) demonstrated, there is much more to be learned from analyses of botanical macrofossils preserved in sediments on the Thracian Plain. A great diversity of plant species do not disperse their pollen in sufficient quantity to be recorded in sediments from as large a site as Straldzha Mire. In many cases where pollen is present, the exact species of plant that produced it cannot be confidently determined, since many different species produce pollen that is alike. Macrofossil analyses may resolve some of this uncertainty, depending on the preservation conditions of the site. The inferences that may be drawn from

macrofossils and pollen are very different, however, especially regarding spatial scale. Pollen is unique among palaeoecological proxies in providing a landscape-scale view of past vegetation, while macrofossils paint a detailed site-specific picture of the local flora. Failure to account for these differences can lead to potentially misleading extrapolations of locally relevant findings to a regional scale (*e.g.*, Magyari *et al.* 2013). The Straldzha Mire is so large (ca. 14,000 ha prior to drainage) that its pollen record is undoubtedly representative of the vegetation history of the Middle Tundzha plain and a nearby section of the Stara Planina as a whole, rather than local vegetation types.

Analysis of macrofossils would provide information on the composition of mire flora and aquatic resources in the past. While botanical macro remains were not seen in any quantity warranting analysis during our sampling campaigns, adequate amounts may be unearthed in sediment samples larger than those the teams were able to collect. Radiometric dating is also of paramount importance in understanding environmental changes in the past, and undoubtedly the conclusions drawn here could be greatly refined with the benefit of more detailed investigations. As the other chapters in this volume attest, there are still many gaps in the archaeological record of the Middle Tundzha plain. Coupled archaeological and palaeoenvironmental investigations have enormous potential to enrich the growing body of knowledge on the fascinating past of this rich and ancient cultural landscape.

13.6 Conclusion

Today's agricultural and pastoral landscapes of the Middle Tundzha plain owe much to their history. From the beginning of the Holocene, open woodlands of oak and elm gradually began to replace the pre-existing steppic and shrubby vegetation as rainfall increased. The mixture of these new and old vegetation types created a mosaic landscape of high diversity. Woodlands reached their maximum density during the Early Bronze Age, yet even so there were clear indications that grazing and cropping were practised at this time. Deforestation of the Middle Tundzha plain occurred in the Middle to Late Bronze Age. Grazing and agriculture followed woodland clearance, developing the heavy soils of the plains. Questions remain, however, concerning the chronology and impetus for deforestation.

14

Yambol survey results

Adela Sobotkova, Shawn Ross, and Ilija K. Iliev

Abstract *This chapter is a summary of the results of two seasons of field survey by the Tundzha Regional Archaeology Project (TRAP), one in the Elhovo study area and the other in the Dodoparon study area of the Yambol province. The survey covered a total of 37 sq km, mostly in intensive and extensive mode. The archaeological residues include 24 surface concentrations, 52 burial mounds, a previously known fortress of Dodoparon, and two previously known prehistoric tells. The chapter focuses on the morphological features and classification of the surface concentrations and burial mounds, as well as preservation and recovery rates. Recovery rates of surface concentrations in the Yambol province seem independent of survey strategy, being consistently similar to the expected rate. While the number of concentrations per sq km in Yambol is lower than in Kazanlak, scatters are larger and higher density. Given the lack of background scatter, concentrations are easy to detect, diminishing the difference between high and low intensity approaches. Yambol's burial mound density of 1.4 mounds per sq km is much lower than in Kazanlak; the mound size distribution, however, corresponds well to the Kazanlak dataset if the Gorno Sahrane necropolis is excluded from the latter.*

Keywords *intensive survey efficiency; burial mounds; surface concentrations; site recovery rates; site definition; Yambol; Elhovo; Dodoparon*

14.1 Introduction

In 2009 and 2010, the Tundzha Regional Archaeology Project (TRAP) organised two seasons of pedestrian survey in the Yambol province, covering over 37 sq km. Over the course of this survey, 79 archaeological sites were inventoried, including 24 surface concentrations and 52 burial mounds (see Fig. 14.1). Two tells and the fortress of Dodoparon also lay near the TRAP study areas and were registered as sites. Four of the 79 locations had previously been documented and mapped in a regional site gazetteer (Popov and Dimitrova 1978).

The artefacts recovered during survey dated to a variety of periods, including the Neolithic, Chalcolithic, Early Bronze Age, Late Bronze Age, Early Iron Age, Late Iron Age, and the Roman, Mediaeval, and Ottoman periods. Many artefact concentrations contained multiple chronological components. Six of the concentrations were sampled via total pickups. A selection of diagnostic artefacts and special finds recovered during survey were inventoried, photographed, and in some cases drawn (see Chapter 3). As was the case in Kazanlak, chronological resolution was coarse. Well-dated artefacts like coins and fine, imported pottery were rare. Outstanding finds included a stone axe (either Neolithic or Bronze Age in date), Black Sea and North Aegean transport amphorae (see Chapter 20), and a coin of Emperor Constantine. Only the coin was found in isolated location; other special finds were part of surface concentrations. TRAP and the Yambol Historical Museum conducted trial excavations at the fortress of Dodoparon, which anchored the Dodoparon study area but lay outside it on a rugged and overgrown hill (Chapter 19). Researchers associated with TRAP excavated the Roman site of Stroyno in the Elhovo study area (Chapter 18). By coincidence, three mounds in the Elhovo study area were also excavated by the Yambol History Museum during 2010 (see Chapter 17). A comprehensive dataset including surface artefact densities, burial mounds, settlements and special-purpose

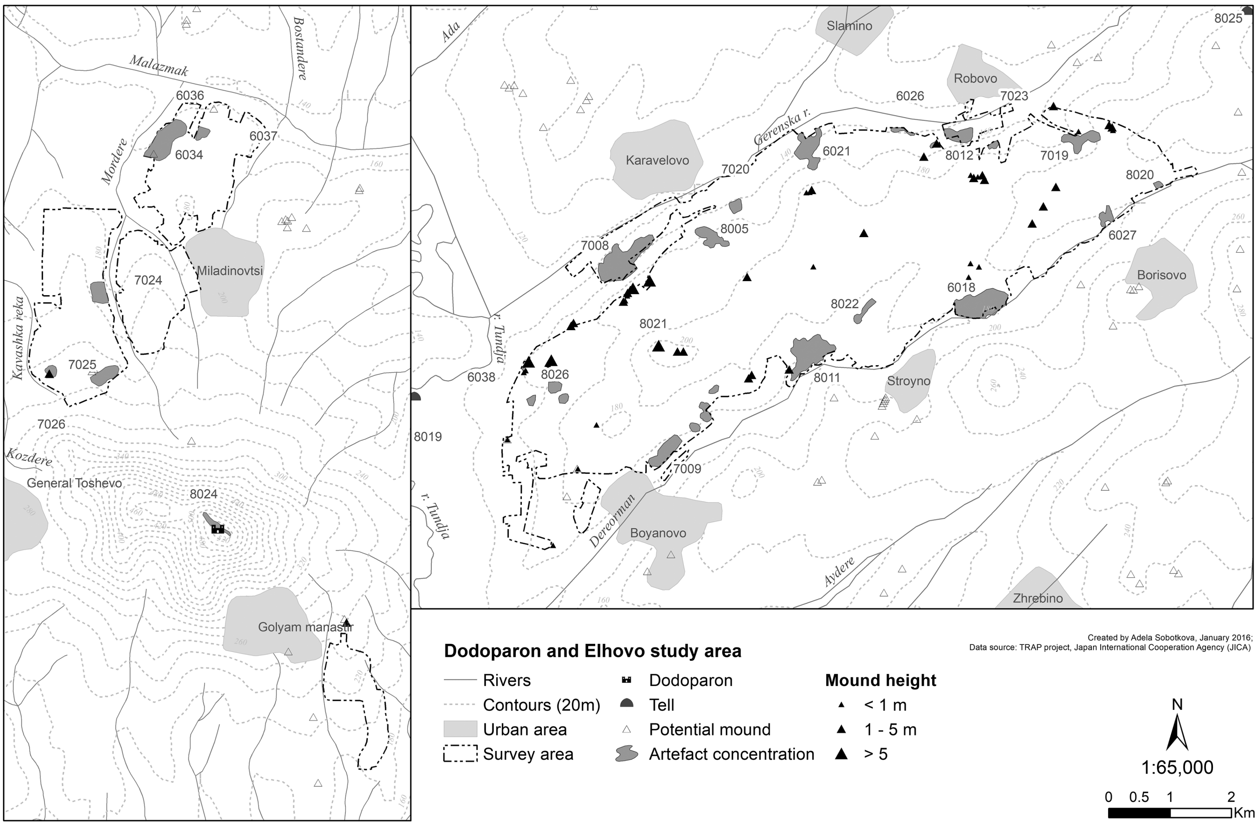


Figure 14.1 Surface concentrations and burial mounds classified by size in the Dodoparon and Elhovo study areas.

areas, and an artefact catalogue can be found in the online resources.[1]

This chapter presents survey progress and coverage over the course of two field seasons. It also discusses two main categories of sites, surface concentrations and burial mounds, including an analyses of recovery rates and their relationship to survey strategy, environmental setting, and post-depositional processes. We compare Yambol study area results with those from Kazanlak throughout the chapter, and discuss possible explanations for differences between the two regions.

14.2 Survey progress

The Yambol province is more amenable to surface survey than the Kazanlak Valley – and most other regions of the Mediterranean, Balkans, and Black Sea. Much of the province, including the TRAP study areas, consists of agricultural land, mostly planted with annual crops and ploughed at least once a year. The terrain presents few obstacles to survey, with a large alluvial plain east of the Tundzha River and moderately rolling terrain west of it. Passability and surface visibility are usually good. Although several villages bordered TRAP study areas, the Yambol province is less developed than the Stara Zagora province.

TRAP conducted two seasons of pedestrian survey in the Yambol province. In the autumn of 2009, three teams walked a contiguous area of 28.5 sq km across a low ridge east of the Middle Tundzha River enclosed by two of its tributaries. Due to its proximity to the town of Elhovo, this sector was labelled the 'Elhovo study area'. In the autumn of 2010, two teams walked an additional 8.7 sq km in the 'Dodoparon study area' to the west of the Tundzha River, on the Thracian Plain to the north of the ancient fortress of Dodoparon. In total, the teams covered 37.2 sq km in 72 team days over the two campaigns (see Table 14.1). Survey in Yambol began a few months after the first TRAP campaign in Kazanlak, allowing us to improve our methods and procedures. Survey conditions (especially passability and surface visibility) were noticeably better in Yambol. The density of surface artefacts in concentrations was twice that of Kazanlak, but the background scatter was about the same (see 'Surface artefacts' section below). These factors combined to make fieldwalking, artefact processing, and documentation faster and more efficient than they had been in Kazanlak. Survey teams covered 0.51–0.52 sq km per team-day during both 2009 and 2010, or just under two team-days (10 person-days) per sq km. In Kazanlak, by comparison, the average pace over three seasons was 0.44 sq km per team-day, or about two-and-a-quarter team-days (somewhat more than 11 person-days)

Table 14.1 Survey progress during the 2009–2010 campaigns

Yambol season	*Teams*	*Team/days in field*	*Total hours in field*	*Avg hours/ day in field*	*Units*	*ATS Units*	*Area surveyed (ha)*	*Units per team/day*	*Ha per team/day*
2009	3	55	286	5.2	3791	0	2,848.9	69	51.8
2010	2	17	94	5.5	981	0	870.2	58	51.2
Total	0	72	380	63.3	4772	0	3,719.1	63	51.5

Table 14.2 Yambol survey coverage, strategy, and concentration recovery statistics

Survey strategy	*Survey Units*	*% of Units*	*Area (sq km)*	*% of Area*	*Unit size (ha)*	*Concentrations*	*Concentrations per sq km*
Urban	5	0.1	0	0	0.1	0	0
Intensive	3891	81.5	26.2	71	0.7	18	0.7
Extensive	876	18.4	11.0	29	1.3	6	0.5
ATS	0	0	0	0	N/A	0	N/A
Total/Avg	4772	100.0	37.19	100.0	0.8	24	0.65

Three known sites (two tells and one fortress) were registered during legacy data verification, but not surveyed and are therefore excluded

per sq km (see Table 8.1). For detailed team progress, see online resources.[2]

14.2.1 Survey coverage

In Yambol, TRAP focused on the investigation of the rolling landscapes near the Middle Tundzha River (see Chapter 11 for survey area description). The study areas included land between 91 and 256 masl, with a mean elevation of 170 masl. Survey encompassed a variety of modern land use. Some 30.3 sq km (81.4%) of the area surveyed was dedicated to annual agriculture, 2 sq km (5.4%) to perennial agriculture, and 3.4 sq km (9.2%) to pasture, while 1.5 sq km (4%) consisted of forest, scrub, or other land cover. The size of survey units varied with land use. The average size of a survey unit in fields used for annual agriculture was 0.7 ha, in perennial fields 1.0 ha, and in low visibility terrain like scrub and forest, 1.2 ha. The predominance of agricultural land use, combined with late autumn survey (after the harvest of summer crops and when winter crops were still seedlings), contributed to good surface visibility and a preponderance of intensive survey (see Chapter 3). Some 26.2 sq km (71%) of the study areas were surveyed intensively and 11 sq km (29%) extensively (see colour figures 11 and 12, and Table 14.2). Adverse terrain survey (ATS) was not required in Yambol as no difficult terrain was surveyed. Again, compared to Kazanlak, the landscapes of Yambol were more accessible and surface visibility was higher. Because of these two factors, large portions of the study areas were surveyed intensively rather than extensively (see also the 'Concentration recovery rates' section below).

14.3 Survey biases

The archaeological surface record in the Yambol study areas has long been subject to post-depositional processes and biases, just like the Kazanlak landscapes. Given the different environmental setting of the Yambol province and the relative remoteness of TRAP study areas, post-depositional processes in Yambol differ in kind, intensity, and impact from those in the Kazanlak study area. Two sources of bias are shared between the study areas: observer bias and bias imposed by modern development (*cf.* Section 8.3, 'Survey biases'). Modern settlements and infrastructure obscure the ancient layers below and create gaps in surface survey coverage, while the intense human activity associated with modern development leads to the exposure of premodern materials. Site gazetteers illustrate this bias through maps where the majority of ancient findspots flank modern settlements, roads, or other infrastructure (Popov and Dimitrova 1978). Development has, however, been slower and more limited in the Yambol study areas than in the Kazanlak Valley. The remoteness of the region, the prevalence of low-impact agriculture, and the presence of a restricted military area along the Turkish border for most of the twentieth century have limited human impact on the archaeological heritage. Since the 2000s, however, increasing development and intensifying agriculture using modern machinery have accelerated degradation of the surface remains in the region. Aside from anthropogenic disruption, fluvial erosion and deposition have combined to obliterate or bury remains near water courses, especially the Tundzha River. Again, however, the impact of erosion and deposition are lower in Yambol than in Kazanlak.

14.3.1 Agricultural activity

Ploughing and other agricultural activities are having a growing impact on the landscapes of the Yambol study areas. Deep, humic soils are ploughed annually. In the past, much of the ploughing has been relatively low-

impact, either due to old tractors or traditional use of animal traction for ploughing. In the last 5–10 years, powerful tractors have appeared that plough 0.5 m deep or more, as in Italy or Greece. The impact of these machines is detrimental not only to surface and subsoil scatters, but also to the burial mounds, parts of which get sliced off every year (*cf.* 'Burial mound size and preservation' below). See Section 8.3.1, 'Agricultural activity', for further discussion of agricultural activity and the archaeological record in Kazanlak, much of which is also relevant to Yambol.

14.3.2 Development

As Chapter 11 asserted, the Yambol province has a low population density and is largely agricultural (now and in the past). As a result, modern development has been slow during the twentieth century, making the region one of the most amenable to survey in Bulgaria.

Yambol shares borders with Greece and Turkey, but the main transit routes lie in the Haskovo province to the west. The remoteness of the region and its agricultural character also contributed to low population density and slow urban growth. In the 1990s, the exodus of military personnel from the border zone spawned a regional demographic decline that is only now being remedied through new initiatives (see Chapter 11). Villages in the southern half of Yambol still contain abandoned structures, like former military housing and associated facilities, sitting vacant and unused.

The biggest development projects in the first half of the twentieth century were major drainage projects for the purpose of land reclamation (the Atolovo Mire near Straldzha), malaria control (just north of the city of Yambol), and flood control on the Tundzha River and its tributaries. There were also experiments with rice cultivation near the modern village of Kabile (Uzunov 1966), where the remnants of the irrigation canals are still visible in satellite imagery. In the same area, a series of pumping stations can be seen (see Fig. 11.5), serving as access points to underground aquifers and elements of an extensive irrigation network built in 1960s. This system still serves the predominantly agricultural economy of the Yambol province.

Industrial development accelerated in the 1990s, starting with the construction of a power plant on the border of the Yambol and Stara Zagora regions (the 'Maritsa Iztok' station; see Panayotov *et al.* 1991). The lack of transportation infrastructure in particular inhibited economic development. After Bulgaria joined the European Union in 2007, gradual repair of the regional road network began. Those improvements and the construction of the Thrakia Highway (connecting Sofia with the Black sea), attracted more visitors and commerce. This highway intersected the survey area of our 2008 pilot project (Ross *et al.* 2010), and development has prompted salvage work by Yambol History Museum staff at archaeological sites around the province.

Mines have operated in the Yambol province from Antiquity through the twentieth century, including in the Dodoparon study area, but have now gone out of use. Stone quarrying, however, is emerging as a major economic activity in the Yambol province. Limestone outcrops scattered through the province provide construction materials. Construction of quarries mostly affects the ancient burial mounds, which occupy some of the same ridges as the outcrops. Dozens of mounds have been excavated in anticipation of quarrying projects (Iliev and Bakardzhiev 2008a, b; Bakardzhiev *et al.* 2011). A quarry was built in the Elhovo study area shortly after our survey campaign there (see Chapter 17).

Overall, industrial and transport development has had less impact on archaeological heritage in the Yambol province than other human activates like farming or natural processes like erosion and deposition.

14.3.3 Fluvial erosion and deposition

Fluvial erosion and deposition have been the main factors behind the burial and displacement of archaeological remains in the past. The flatness of the region and low river banks allow regular but localised flooding of the Tundzha. Smaller-scale effects of flooding were also noted along some tributaries during snowmelt (see Chapter 18). Since the 1960s, floods and alluvial deposition have been limited through the channelisation of the Tundzha and its tributaries, as well as the construction of small dams on the tributaries. Even prior to the regulation of the rivers, flooding would usually have been limited to specific topographic areas, such as the marshy lowlands north and north-east of Yambol city (*e.g.* Section 13.3, 'Straldzha Mire'). Ancient populations would have recognised these areas. Furthermore, the TRAP pilot project around Kabyle in 2008 (Ross *et al.* 2010) revealed prehistoric, Early Iron Age, and Roman scatters near the Tundzha, confirming that alluvial activity (flooding, erosion, or deposition), must have been localised for these settlements to exist and for us to find them. The Yambol study areas do not have any extensive depositional zones comparable to the foot of the Stara Planina in Kazanlak.

14.3.4 Military presence

The Yambol province shares a border with both Turkey and Greece, which was a restricted military zone from 1950 to 1990. The border zone inhibited development in the past, resulting in relatively little modern disturbance of archaeological heritage. It also restricted archaeological research and illicit looting. Military housings, barracks, tank emplacements, aircraft facilities and runways, bunkers, and other installations stand abandoned as witnesses to their time. Unlike Kazanlak, military activities in Yambol conserved rather than disrupted the landscapes by dissuading instead of attracting people and activity.

14.3.5 Teams and training

Many of the same observer biases apply to both Kazanlak and Yambol (see Section 3.5, 'Survey issues and biases'). During survey in Yambol, TRAP teams benefited from having museum personnel directly involved in fieldwalking, material processing, and training, as well as having previously tested field methods in Kazanlak.

Yambol History Museum staff readily adopted TRAP methodologies. Three or four took part in daily fieldwalking, which gave us immediate access to their expertise. Museum staff assessed artefacts as they were found, accelerating progress and documentation, and assisted with later classification of artefacts during inventory. Together, project staff had considerable experience with prehistoric, Roman, and Mediaeval materials, less with Late Iron Age and Late Antique (a Late Antique expert was available during the 2010 season). Since the campaigns in Yambol occurred after those in Kazanlak, there was time to fine-tune field methods and document procedures before they were used in Yambol. Project personnel had also become more familiar with typical artefact types. Greater experience, improved protocols, proven procedures, and training organised by museum staff, combined to produce better prepared and more efficient project participants. As a result, fieldwork in Yambol was more productive than in Kazanlak.

14.4 Results

14.4.1 Surface artefacts in Yambol

Some 113,334 surface artefacts were counted across 4,772 survey units covering 37.2 sq km in the Yambol study areas. Of these artefacts, 62,039 (55%) were classified as ancient (colour figure 13). In addition, 507 unit samples were collected, yielding 1,628 diagnostic artefacts (*ca.* 1% of the total and 2% of the ancient artefacts). In other words, an average square kilometre contained 3,046 sherds and 44 diagnostics, and an average survey unit contained 24 artefacts, out of which 0.3 were diagnostic. Again, ceramics were most common, with a few lithics and rare finds of other types. Ceramic wear and fragmentation were uniform throughout the Yambol study area and less severe than in Kazanlak. The total amount of surface material from Yambol was two to three times that from Kazanlak, despite a smaller survey area (see Section 8.4.1, 'Surface artefacts in Kazanlak'). Artefact concentrations were well-bounded and recognisable against a sparse background scatter.

14.4.2 Surface artefact concentrations

Two fieldwork campaigns, one in each study area, inventoried 24 surface concentrations. Two tells (8019 Konevetz; 8025 Kamenetz) and a fortress with visible masonry (8024 Dodoparon) lay in the immediate vicinity of the study areas, but outside their boundaries (see Fig. 14.1). Due to their proximity, significance, and the amount of diagnostic archaeological material associated with them, these legacy sites are important for understanding the study areas and were, therefore, designated as sites and included in our analysis. Six sites had been known previously. The two tells (8019, 8025), Stroyno (6018), Dodoparon (8024), Robovo cemetery (7019), and the prehistoric concentration near the new quarry (8021) had been mentioned in literature or reported to the Yambol History Museum (Fig. 14.1; Bakardzhiev 2007; Dimitrova and Popov 1978; Lichardus *et al.* 2004).

Some 15 sites show evidence of permanent settlement (*i.e.*, the presence of building materials and a range of domestic pottery, *cf.* Chapter 3); the remainder were classified as 'special-purpose' sites of one kind or another. Two concentrations were interpreted as seasonal, temporary, or ancillary agricultural installations based on a limited range of finds besides architectural material (7009, 7024). Another two had traces of ritual activity: high quality pottery embedded in ashy soil with a scarcity of architectural material (6034, 6037; compare 2031 in Kazanlak). Three concentrations were marked as 'activity areas'. They consisted of isolated groups of a few diagnostic pottery fragments, such as decorated prehistoric shards or handles of Early Iron Age drinking vessels, but were devoid of any other surface material. Several surface concentrations (*e.g.*, 6038, 7019, 7021, 7023, 7026, 8005, 8023) were associated with burial mounds and produced a narrow assemblage of materials, suggesting mortuary or ritual origin.

The nature of low-density artefact concentrations posed an interpretive challenge (*e.g.*, 8021, 8022, 8026). Such concentrations were rarer in Yambol than in Kazanlak. Based on topography, observation of modern agriculture, and artefact fragmentation, these low-density concentrations were attributed to the dispersal of artefacts by post-depositional processes, such as ploughing and erosion, rather than to off-site activities such as manuring in the past (Ammerman 1985, *contra* Wilkinson 1989).

Surface concentrations and burial mounds followed a clear pattern, especially in the Elhovo study area (see Fig. 14.1). Most of the concentrations identified as settlements were distributed at regular intervals along the riverbanks and lower hillsides above the Gerenska and Dereorman Rivers that bounded the Elhovo study area to the north and south (see Chapter 16). These settlements were located close to water, with access to good farmland. Burial mounds, conversely, were built higher up the slopes of the ridge separating the two Tundzha tributaries. This pattern of settlement-mortuary division was also present in the Dodoparon study area, if not quite so clearly (perhaps because the area was too small to reveal it well). The only elevated settlement in

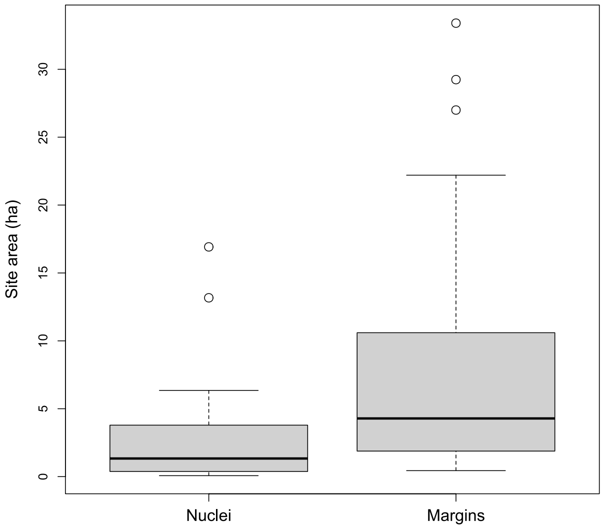


Figure 14.2 Boxplots of Yambol site nucleus and margin sizes.

either study area was Dodoparon itself, built on a high hill for defensive purposes.

Concentrations in Yambol were defined the same way as in Kazanlak, with a 'nucleus' denoting the area of highest artefact density, and a 'margin' representing the more tenuous and extensive zone of the artefact concentration (Chapter 3). Boxplots of these two concentration zones conform to expectations, with nuclei values being smaller and more tightly clustered than the margins (Fig. 14.2). In other words, nuclei were usually smaller than margins, and the size of nuclei varied less than the size of margins.

The extents of nuclei ranged from 0.1 to 16.9 ha, with a median of 1.2 ha. Nearly half the nuclei (13 or 48%) are < 1 ha. Almost as many (11 or 40%) are 1–5 ha, while one (4%) is 5–10 ha, and two (8%) are > 10 ha. The 'bottom-heavy' and short boxplot resembles that of Kazanlak, where the trend is accentuated due to a larger number of small sites (see Fig. 8.4). A bottom-heavy distribution conforms to the expected hierarchy of settlement, where sites decrease in number as they increase in size (*cf.* Haggett *et al.* 1977).

The area of site margins in Yambol ranged from 0.4 to 33.4 ha, with a median of 4.2 ha (Fig. 14.2). Some 11% of site margins are < 1 ha, 44% are 1–5 ha, 20% are 6–10 ha, and 25% are > 10 ha. The tall boxplot indicates that margin sizes vary more than nuclei (a pattern that also holds for Kazanlak; *cf.* Fig. 8.4). Likewise, the extended upper whisker signals the presence of many large concentrations (10–25 ha). Outliers above 25 ha are marked with separate points. No margin is smaller than 0.5 ha. Given that margins denote the extent of low-density material, which results from post-depositional dispersal (see above), the large size of margins meets expectations. Like nuclei, their distribution is unsurprising, with more smaller sites and fewer larger sites.

The boxplots in Figure 14.2 resemble those in Figure 8.4 from Kazanlak in the tight and bottom-heavy distribution of nuclei and more dispersed distribution of margins. There are, however, differences between the two regions. Fewer sites with 0.5 ha margins occur in Yambol than in Kazanlak. Nuclei and margins are both smaller on average, and the upper bounds of boxes and whiskers reach higher in the Yambol boxplot. Kazanlak has more outliers. Yambol sites are less numerous but tend to be larger, with fewer atypical sites.

In short, Yambol surface concentrations follow an expected size distribution. They are, however, denser with artefacts and more spatially bounded than in Kazanlak. In terms of frequency, Yambol had fewer concentrations than Kazanlak, but they tend to be larger. These observations suggest that the archaeological remains in the Yambol study areas reflect some combination of different settlement patterns and more favourable preservation conditions, both of which could contribute to the disproportionately higher artefact recovery rate and the greater size and conspicuousness of concentrations. See Chapter 16 for further analyses, especially regarding the evolution of settlement patterns over time.

14.4.3 Burial mounds in Yambol

TRAP registered 52 mounds in the two Yambol survey areas, or ca. 1.4 mounds per sq km. An additional 140 burial mounds were registered in the topographic maps within a 5 km buffer of the two survey areas, indicating that this mound density (low compared to Kazanlak) was not a particular feature of the selected study areas, but a regional phenomenon (see Fig. 14.1). In both Yambol study areas, burial mounds occurred as either solitary monuments or in small necropoleis of three to five mounds. Excavations of three mounds at a modern quarry site north of Boyanovo village illustrate that mounds within these clusters are not necessarily chronologically or culturally related (see Chapter 17). While the three Boyanovo mounds looked similar at first sight, their contents were distinct: one contained inhumations dated to the Early Bronze Age and Late Bronze Age, another contained Late Bronze Age inhumations and a Roman cremation, while the third was an empty cenotaph.

As discussed above, burial mounds tended to lay on the upper slopes of ridgelines and other elevated locations. This pattern is most clear in the Elhovo study area, which focused on such a ridge and the two Tundzha tributary streams that bracketed it. By contrast, the majority of surface concentrations identified as settlements tended to be found on the lower hillsides and banks of the Tundzha tributaries. Habitations and mortuary zones thus appear separated in space (see Fig. 14.1 and colour figure 13). This pattern was not exclusive to the Elhovo

Table 14.3 Burial mounds classified by size and surrounding land use: a comparison of the Kazanlak dataset (excluding the Gorno Sahrane necropolis) and the Yambol dataset.

Land use and height	*< 1 m*	*%*	*1–5 m*	*%*	*> 5 m*	*%*	*Total*
			Yambol				
Agriculture	12	31	25	64	2	5	39
Pasture	0	0	3	75	1	25	4
Forest	1	11	6	67	2	22	9
Total	13	25	34	65	5	10	52
			Kazanlak excluding Gorno Sahrane				
Agriculture	24	24	68	67	10	10	102
Pasture	49	24	137	67	19	9	205
Forest	7	9	64	82	7	9	78
Total	80	21	269	70	36	9	385

Land use around the mound is used for calculations as opposed to that covering the mantle

Table 14.4 Burial mounds classified by size, a comparison of the Kazanlak dataset (including and excluding the Gorno Sahrane necropolis) and the Yambol dataset

Burial mound height	*< 1 m*	*%*	*1–5 m*	*%*	*> 5 m*	*%*	*Total*
Kazanlak	500	65	234	30	39	5	773
Kazanlak excluding Gorno Sahrane	80	21	269	70	36	9	385
Yambol	13	25	34	65	5	10	52

study area, but seemed to repeat on the neighbouring ridges to the north and south. The Dodoparon study area also displayed a separation of mounds and habitations. The relationship of mounds and habitations within the complex palimpsest of the Kazanlak Valley is not as obvious as in Yambol.

The regularity and duration of this settlement-burial pattern implies continuity in mortuary practices from the Early Bronze Age to the Roman period. While mound groups need not represent communities of shared descent or identity (as the Boyanovo necropolis revealed), their consistent placement nonetheless indicates long-term continuation of established mortuary practices. These practices divide the spaces reserved for the living, often on riverbanks and lower slopes, from areas reserved for burial, usually on ridgelines.

Fragments of pottery and lithics were occasionally recovered near burial mounds. Some were clearly associated with looting (*e.g.*, 6005, 6006), but the origin of others was unclear (6038, 7021, 7026, 8005, 8023). It is possible that fragments eroded from the mantle of the mounds naturally, that grave contents were disrupted by looters, or that artefacts were associated with burial ceremonies. The origin of these artefacts could not be determined from the surface record.

Unlike the Kazanlak study area, where mound density varied considerably by land use, mound density in the Yambol study areas was consistent except in scrub and forest (Table 14.7). Fields used for annual and perennial agriculture (which together accounted for 87% of the study areas) contained 39 of 52 mounds (1.2 per sq km), pastures (9% of the study areas) contained four mounds (1.3 per sq km), while scrub and forest (4% of the study areas) contained nine mounds (6 per sq km). The high density of mounds in scrub or forest likely results from the fact that mounds in field boundaries suffer less from agricultural damage. Note that unlike Kazanlak, annual and perennial agriculture have been combined in this analysis because annual agriculture is so predominant (see Chapter 11).

14.4.3.1 Burial mound size and preservation; a comparison with Kazanlak

We inventoried far fewer mounds in Yambol than in Kazanlak (52 vs. 773). Kazanlak mounds are described in Chapter 8, 'Burial mounds in Kazanlak'; this section presents a comparison. To that end, Yambol mounds have been divided into the same three height groups as those from Kazanlak: small (< 1 m high), medium (1–5 m), and large (> 5 m). Some 13 mounds (25%) in Yambol are small, 34 (65%) are medium, and five (10%) are large. As in Kazanlak, the size thresholds are arbitrary, and the histogram of Yambol mound size suggests that 2 m might represent a better bin division. Using the same bins as Kazanlak, however, facilitates comparison of the datasets. Given the predominance of medium-sized mounds (65%, compared to 30% in Kazanlak; see Fig. 14.1 and Table 14.4), mound identification was relatively straightforward in Yambol. The rarity of fieldstone piles, military earthworks, and other confounding modern features also made the mound identification easier.

Table 14.5 A comparison of burial mound condition in the Kazanlak dataset (including and excluding the Gorno Sahrane necropolis) and the Yambol dataset

Mound condition	*1 – pristine*	*%*	*2*	*%*	*3*	*%*	*4*	*%*	*5 – extinct*	*%*	*Total*
Kazanlak	26	3	406	53	188	24	123	16	30	4	773
Kazanlak excluding Gorno Sahrane	24	6	131	34	144	37	67	17	19	5	385
Yambol	9	17	12	23	6	12	8	15	17	33	52

Table 14.6 Yambol burial mounds classified by condition and surrounding land use

Mound condition	*1 – pristine*	*2*	*3*	*4*	*5 – extinct*	*Total*
Annual agriculture	5	7	3	8	16	39
Pasture	2	1	1	0	0	4
Forest and scrub	2	4	2	0	1	9
Total	9	12	6	8	17	52

Dividing mounds by land use (see Tables 14.3 and 14.4), the mounds in agricultural fields were 31% small, 64% medium, and 5% large. Only four mounds were found in pasture, of which 75% were medium and 25% large. Forest and scrub contained 11% small mounds, 67% medium, and 22% large. Dividing by size, small mounds occurred mainly in agricultural fields (12 of 13; 92%), as did medium mounds (24 of 35; 74%), while the five large mounds were distributed relatively evenly between agricultural fields (2; 40%), pasture (1; 20%), and scrub and forest (2; 40%). These figures reflect two results: most mounds were of medium height (65%), and most land use was agricultural (87%). Unsurprisingly, nearly half of the mounds (25; 48%) were medium-sized and in agricultural land.

Yambol had a lower density of mounds (1.4 per sq km vs. 9 per sq km in Kazanlak), a much lower proportion of small mounds (25% vs. 65%), and a higher proportion of medium (65% vs. 30%) and large (10% vs. 5%) mounds. Moreover, small mounds in Kazanlak typically occur in pastures (70%; *cf.* Table 8.5), while in Yambol submeter mounds appear almost exclusively on agricultural land (92%).

Most of these differences disappear if the Gorno Sahrane necropolis is eliminated from the Kazanlak dataset. Gorno Sahrane contained nearly 400, mostly small, burial mounds situated in pastureland (*cf.* Fig. 8.5). The Yambol study areas have no analogue of the Gorno Sahrane necropolis, and very little pastureland (9%). Excluding Gorno Sahrane, the number of mounds in the Kazanlak dataset drops to 385, and the density declines to 4.5 per sq km. The proportion of small, medium, and large mounds in Kazanlak realigns with Yambol: the mounds in the restricted Kazanlak dataset are 21% small, 70% medium, and 9% large, versus 25%, 65%, and 10% respectively in Yambol (Table 14.4).

Neither a chi-square nor a t-test indicates a statistically significant difference between these distributions of mound size. The consistency extends to the distribution of mounds sizes across different land uses (Table 14.3). For example, mounds in the agricultural fields of Kazanlak, are 24% small, 67% medium, and 10% large, while the figures are 31%, 64%, and 5% in Yambol. The percentages of small and large mounds in each land-use type vary more between the two datasets (*e.g.*, no small mounds occur in pasture in Yambol, and the distribution of large mounds across all land-use types differs considerably between the two regions, see Table 14.3). The paucity of small (n=13) and large (n=5) mounds in the Yambol dataset probably accounts for this variance (or at least makes it impossible to assess the difference statistically).

As in Kazanlak, many burial mounds in Yambol had been damaged (colour figure 8). One-third (17 of 52) of mounds in the Yambol study areas had been classified as extinct, destroyed, or removed (CRM=5), as opposed to 5% (19 out of 385) in the restricted Kazanlak dataset (Table 14.5). Among the standing mounds, however, nearly a fifth (17%) were still 'intact' (CRM=1) in Yambol, as opposed to only 6% in Kazanlak. Applying a subjective assessment, agricultural activities had the biggest impact on the Yambol mounds, while looting was a more frequent cause of damage in Kazanlak (although both agricultural and looting damage occurred in both regions). This judgment is consistent with a recent regional assessment of mound damage in the Yambol province (Weissová 2016). Regardless of cause, the mounds in both regions have suffered equally. If the preservation categories in Yambol are simplified to match Kazanlak (combining CRM categories 1–2 and 3–5), similar proportions of mounds are found to be lightly damaged (40%) versus heavily damaged or destroyed (60%).

Classifying preservation of mounds by land use (Table 14.6), 16 (94%) of the extinct mounds (CRM=5) lay in agricultural fields, with one (6%) in forest and scrub. Intact mounds (CRM=1) were divided between agricultural fields (56%), pasture (22%), and forest and scrub (22%). Lightly damaged mounds (CRM=2) follow

the ratios of intact mounds. In agricultural fields (the main land-use type with 39 of 52 mounds), all mound conditions are represented: 13% are intact, 18% are lightly damaged, 8% damaged, and 21% heavily damaged, and 41% extinct. Note that 62% of mounds were heavily damaged or extinct. Other land-use zones had better preservation. If pasture and forest and scrub are combined (which together held 13 of 52 mounds), only 8% were heavily damaged or extinct, 23% were damaged, while 69% were intact or slightly damaged. Overall, mounds in agricultural fields were more susceptible to serious damage, supporting the intuitive view that ploughing and other agricultural activities were the primary cause of damage in Yambol. Formal excavation, which accounted for some of the extinct mounds, produced damage that has hopefully been mitigated by systematic recording (Agre 2008a, b; 2010; 2012; 2013; Bakardzhiev *et al.* 2011).

Overall, the Yambol study areas offer a few parallels to large and impressive mounds such as Shushmanets, Ostrusha, and Golyama Kosmatka in Kazanlak, which provide evidence of elite communities capable of mustering resources to build large mortuary monuments (Kitov 1994; Filov *et al.* 1934; Kisyov 2004; Archibald 1998). The middle tier of mounds is well represented in both Yambol and Kazanlak. The Yambol study areas have no parallel to the Gorno Sahrane necropolis of small mounds, which also appears to reflect the particular social or cultural circumstances of the Kazanlak Valley. If Gorno Sahrane is excluded from analysis, the size ratios of mounds in Yambol resemble those in Kazanlak. The distribution of mound sizes between the Yambol and restricted Kazanlak dataset are statistically indistinguishable. The relative role of patterns in mound building versus mound preservation to produce these mortuary landscapes requires further investigation.

14.5 Survey intensity and site recovery in Yambol

14.5.1 Surface concentrations – recovery rates

Twenty-four surface artefact concentrations were found within the two Yambol study areas. Some 18 of these concentrations (75%) were discovered during intensive survey and six concentrations (25%) during extensive (see Table 14.2). The 37 sq km study areas included 26 sq km (71%) of terrain with good surface visibility examined using intensive survey, and 11 sq km (29%) of terrain with poor surface visibility examined using extensive survey. None of the area surveyed had passability difficult enough to require ATS. The resulting recovery rates for concentrations were 0.7 per sq km during intensive survey (18 in 26 sq km) and 0.5 per sq km during extensive (six in 11 sq km), producing an intensive-to-extensive recovery rate ratio of 1.4:1. The average recovery rate across both approaches was somewhat over 0.6 concentrations per sq km (24 in 37 sq km).

The average recovery rate would have produced 17 concentrations in 26 sq km (the area of intensive survey) and seven concentrations in 11 sq km (the area of extensive survey), meaning that intensive survey over-performed the average by one concentration while extensive underperformed by one. The difference is not statistically significant in such a small dataset. The parity of the two methods is still surprising. Both methods recover sites at about the average rate, despite the greater effort invested into intensive survey. By contrast, the two methods had dramatically different productivity in Kazanlak, where the intensive-to-extensive recovery rate ratio was 2.4:1 (intensive survey yielded 1.2 per sq km and extensive 0.5 per sq km). Comparing Yambol to Kazanlak, recovery rates during extensive survey were about the same (0.5 per sq km), but recovery rates during intensive survey were much lower (0.7 vs. 1.2 per sq km). Looking beyond Bulgaria, none of the TRAP study areas approached the 7:1 intensive-to-extensive recovery rate ration reported by Terrenato and Ammerman (1996) in Italy.

The smaller-than-expected difference between intensive and extensive recovery rates in Yambol is probably the result of better survey conditions and the existence of more artefacts on the surface. Yambol had an average recovery rate of 3,046 shards and 44 diagnostics per sq km, mostly aggregated into large, dense, and well-bounded concentrations. In Kazanlak, by contrast, the rate was 1,004 sherds and 12 diagnostics per sq km (see Section 8.4.1, 'Surface artefacts in Kazanlak'). At the same time, Yambol had a lower frequency of concentrations than Kazanlak (0.6 vs. 0.9 per sq km). Surface concentrations were simply larger, denser, and easier to distinguish from background scatter in Yambol, regardless of method applied.

Human activity was more spatially persistent in Yambol. Sites had longer occupation spans (see Chapter 15), producing more artefacts over their lifespans to create larger and denser surface concentrations. Moreover, easier terrain, less modern material, and more obtrusive artefacts allowed concentrations to be discovered even when surface visibility was lower. These results contradict expectations that better surface visibility and higher survey intensity should produce more sites for the same area surveyed (*contra* Plog, Plog and Wait 1978, Fig. 10.1; Cherry 1983, Fig. 1; Terrenato and Ammerman 1996). They indicate that extensive survey is well suited to the Yambol environment, or perhaps that our walker-spacing threshold dividing intensive from extensive survey (20 m) could be increased.

14.5.2 Burial mounds – recovery rates

The mound recovery rates in Yambol were mostly determined by land use. On average, the Yambol study areas yielded 1.4 mounds per sq km, as opposed to 4.5 mounds per sq km in Kazanlak (again excluding the exceptional Gorno Sahrane necropolis). When broken

Table 14.7 Mound recovery rates by land use

Land use	*Area (sq km)*	*% of area*	*Mounds*	*% of total*	*Mounds per sq km*
Annual agriculture	30.3	82	39	75	1.3
Perennial agriculture	2.0	5	0	0	0
Pasture	3.4	9	4	8	1.2
Forest or scrub	1.5	4	9	17	6.0
Total	37.2	100	52	100	1.4

down by land use, recovery rates in Yambol were 1.2 mound per sq km in pasture, 1.3 per sq km in agricultural fields, and 6 per sq km in scrub and forest (Table 14.7). The recovery rate in agricultural areas is indicative for the region, given the predominance of that land use (and observing that the recovery rate in pasture was almost the same).

Recovery rates in other land uses should be approached cautiously, due to the small sample size. Still, the rate in forest and scrub is similar between Yambol and Kazanlak (6 vs. 6.4 per sq km respectively), despite the fact that Kazanlak has much more forest and scrub than Yambol (12.4% vs. 4%). The high recovery rate of mounds in forest and scrub in both regions may arise from a combination of agricultural practice and recording methodology. Mounds were placed into a land-use category based on their immediate environs. Farmers have long avoided ploughing over mounds, creating overgrown strips or patches. Thus, mounds designated in 'scrub and forest' often sat in relatively small, uncultivated zones around and between agricultural fields (note that if only the mound itself was overgrown, creating an island of brush in the midst of a cultivated field, we designated its land use as 'agricultural').

14.6 Discussion

TRAP used consistent methodologies in all Kazanlak and Yambol study areas, producing comparable datasets. Survey produced many more sites in Kazanlak (773 burial mounds and 82 surface concentrations interpreted as 72 sites) than in Yambol (52 burial mounds and 24 artefact concentrations / sites). The higher numbers in Kazanlak are the result of a larger survey area (86 sq km vs. 37 sq km), a more varied environment (Yambol lacks alpine zones, colluvial fans, and a variety of soil types), or local variation in material culture (especially regarding burial mounds; see Section 8.6.2, 'Kazanlak burial mounds and parallels'). Both areas exhibit similar sites and artefacts, from isolated finds of coins and lithics to surface artefact concentrations, tells, forts, and burial mounds. Kazanlak site types are somewhat more diverse, as they include quarries and elite feasting sites. Again, the larger survey area (and correspondingly larger dataset) or the more diverse environment may explain the variety.

Some of the differences in the archaeological residues are less intuitive. Yambol exhibits consistently higher surface artefact densities and site sizes. The average artefact density (3,046 sherds and 44 diagnostics per sq km) is more than double that of Kazanlak (ca. 1,400 artefacts and 16 diagnostics per sq km, even after excluding ATS areas). The proportion of sites < 1 ha in each area also varies. Kazanlak site nuclei are dominated by these small sites (68%), while they comprise less than half of the Yambol nuclei (48%). If site margins are used as a measure, the difference is even more pronounced: half (51%) of Kazanlak sites margins are < 1 ha, compared to only 11% of Yambol margins. By all measures, sites in Yambol are generally larger and more dense with artefacts.

Observer bias is an unlikely reason for this difference in the artefact densities, since survey strategies were consistent across all study areas. Other explanations merit consideration. First, site function may have differed systematically between the regions, along with associated consumption and discard patterns. Sites in Kazanlak may be smaller and more numerous because the diverse environment spawned more short-term, single-purpose activity areas and habitations that varied in function from one to the next. Yambol sites may be larger because they included a higher proportion of long-term, multi-use settlements. These communities may have been more prosperous than their Kazanlak counterparts, producing, consuming, and discarding more material to enter the archaeological record. Second, the long-term stability and spatial continuity of Yambol settlements may have generated more material in the same place, leading to higher artefact density and larger site size vis-a-vis the more fluid and short-term sites in Kazanlak (see Schiffer and House 1975; Chapters 9 and 15 this volume). Third, the study areas in Yambol suffer less from adverse post-depositional processes, leading to better preservation, exposure, and recovery of archaeological materials (see above and Chapter 7). Fourth, more conducive survey conditions in Yambol may have improved survey recovery rates, even if artefact production was similar in both regions.

It is not surprising that two regions produce different results, but it is difficult to determine which of the two represents a typical historical landscape in or near the Thracian Plain. Each archaeological record is a product of its distinct environmental setting, settlement history, and post-depositional processes. Further investigation of regional variation, and comparison with survey data from elsewhere, are needed, but are beyond the scope

of the present chapter. Publication of TRAP datasets opens an avenue for further evaluation of our results and interpretations, as well as comparisons with other survey datasets from Bulgaria and beyond.

14.7 Conclusion

During two TRAP seasons in the Yambol province, survey teams documented 24 artefact concentrations and 52 burial mounds across 37.2 sq km of rural landscape, divided between two study areas (Elhovo and Dodoparon). The environment was more conducive to survey than in Kazanlak. Surface artefacts were more plentiful and better preserved. Artefact concentrations were denser, larger, and easier to distinguish from the background scatter. Because of these factors, extensive survey was more effective than expected (compared either to Kazanlak or to results elsewhere in the Mediterranean). Conversely, the density of sites was lower in Yambol than Kazanlak, with an average recovery rate of 0.65 per sq km (compared to 0.9 in Kazanlak). Fewer, larger concentrations may reflect more long-term and nucleated habitation in Yambol, as opposed to more dynamic and dispersed settlement patterns in Kazanlak.

The Yambol and Kazanlak mound datasets shared many traits. In Yambol, medium-height (1–5 m) mounds predominated, which is consistent with Kazanlak if the Gorno Sahrane necropolis is excluded. The condition of the mounds also resembled that of Kazanlak, with 40% lightly damaged and 60% heavily damaged. In other respects, the burial mounds differed between the two regions. The primary cause of damage to Yambol mounds was agricultural activity, while looting played a secondary role (as opposed to Kazanlak, where the importance of these two factors was reversed). The density of mounds in Yambol was much lower. Yambol study areas also lacked both the abundance of rich Hellenistic burials in very large mounds, and an extensive necropolis like Gorno Sahrane that contained many small mounds. These phenomena may mark Kazanlak as exceptional, but the Yambol sample is smaller and fewer mounds have been excavated. As a result, it is not yet clear which region is more representative of mortuary landscapes.

Notes

1 Yambol site table – DOI: https://doi.org/10.6078/M7QN64T4; Yambol burial mounds – DOI: https://doi.org/10.6078/M7G44NBZ; TRAP Artefact catalogue – DOI: https://doi.org/10.6078/M7BP00VK

2 Yambol survey progress details – DOI: https://doi.org/10.6078/M72Z13KW

15

Assessing contemporaneity and uncertainty in the Yambol province datasets

Adela Sobotkova

Abstract *In this chapter, Dewar's model is applied to the Yambol dataset of the Tundzha Regional Archaeology Project (TRAP) to estimate the number of contemporaneous sites and habitations, and their mean occupation span. After correcting the raw survey data, I assess the impact of restricting analysis to functionally certain sites (habitations), and compare the Yambol results with those from Kazanlak (see Chapter 9). After the application of Dewar's model, the Early Iron Age peak in site counts is revised downwards, and the Roman period emerges as the apex of long-term settlement development. The low number of Late Iron Age habitations makes the period impossible to evaluate. Functional uncertainty has a mild impact on the data. Excluding sites that have an uncertain function, and thereby restricting analysis to the habitation dataset, leads to lower estimates of contemporaneous settlements but longer occupation-span averages than is the case in the unrestricted site dataset. Long-term trends in settlement dynamics remain the same, however, across both datasets. Yambol results are consistent with the corrected datasets in Kazanlak, although settlement evolution in Kazanlak inflects around the Late Iron Age rather than the Roman period. Despite abundant contemporaneous sites, the dynamics of the Late Iron Age in Kazanlak were unsettled and in flux, with communities moving more frequently than in Yambol.*

Keywords *Occupation span; Dewar; contemporaneity; temporal resolution; synchronic analysis; settlement patterns*

15.1 Introduction

Chronological coarseness is a well-known limitation of survey data, potentially leading to inflated site counts and a contemporaneity problem. The Yambol dataset produced by the Tundzha Regional Archaeology Project (TRAP) suffers from this problem, although for different reasons than the Kazanlak dataset (see Chapter 9). Many Kazanlak sites suffer from low artefact density, or uncharacteristic material, but in Yambol the ambiguity arises from later reuse of the registered sites. Later materials render the boundaries of earlier components fuzzier, make their function more ambiguous, and inflate estimates of site occupation span. Dewar's probabilistic model helps correct site numbers by estimating the number of contemporary settlements in each chronological period. After correcting the count and mean use spans for all sites and for the more limited category of habitations, this chapter assesses the impact of functional restriction on these estimates in the Yambol dataset. Settlement dynamics in the Yambol and Kazanlak study area are briefly then compared, especially with respect to mobility and stability in Late Iron Age and Roman communities.

15.2 Applying Dewar's model to the Yambol datasets

Mirroring Chapter 9, I apply Dewar's model to the Yambol dataset in order to estimate site contemporaneity and assess site mean use span, using the same chronological periods as in Kazanlak. This analysis covers the Late Bronze Age through the Early Byzantine era (1600 BC to AD 900). Unlike in Kazanlak, I do not try to account for temporal uncertainty because, with the exception of Late Iron Age, little temporal uncertainty was encountered at Yambol sites. Furthermore, since the sample was small to begin with, additional restriction would render the application of Dewar's model ineffective. Instead, I only attempt to assess the impact of functional uncertainty – doubt over

whether or not a site was a permanent habitation – on the estimates of contemporaneous occupations and use span. As such, two variations of the Yambol dataset are subjected to analysis: all registered sites, and sites designated as habitations. Tables 15.1 and 15.2 summarise the results of the broad and restricted datasets respectively.

The concepts used in Dewar's model are explained in Chapter 9; the reader is referred there to avoid repetition here. Tables 15.1 and 15.2 list the total number of sites or habitations (N), a count of sites that fall into each of the four occupation span types (A-D), the rates of settlement establishment and abandonment ('Eocc' and 'Aocc' respectively), an estimate of the average number of simultaneous occupations ('Mean Occ'), and the average occupation span in years ('Mean Use Span'). The standard deviation attached to the 'Mean Occ' estimate is important, since it communicates the range of variability for a given estimate. Higher standard deviation values also indicate greater variability in site occupation span during the period. See, for example the estimates of contemporary sites during Late Antiquity in Table 15.1 (4.25±2.17 sites and 158±81 years), where the standard deviation is over half of the estimate of contemporary sites and occupation span.

15.2.1 Estimating contemporaneous sites in the Yambol province (no functional restriction)

Table 15.1 shows the broadest dataset of Yambol sites, which includes a total of five Late Bronze Age sites. The estimate of contemporaneous sites (1.75±1.01 sites) and the long estimate of mean use span (878±505 years) are, however, unreliable due to low overall site count and the lack of any known Middle Bronze Age sites.

In the Early Iron Age, the number of sites triples (from five to 15). This increase matches a tripling of the estimate of simultaneous sites from 1.75±1.01 to 5.21±0.70. The estimate of contemporaneous sites represents 35% of the raw site count in the Early Iron Age. This low percentage is due to a large number (six of 15) of single-phase sites (span type D), established and abandoned during the Early Iron Age. The average occupation span of an Early Iron Age site is estimated to be 332±47 years. The standard deviation in the contemporary site estimate is low (±0.70 sites), producing an equally low variation in the average site occupation span (±47 years).

During the Late Iron Age, the total number of sites decreases from 15 to 11, leaving a count only just large enough to calculate estimates. This decline disproportionally affects single-phase sites (span type D), which drop from six to two. Three-phase sites (span type B) increase from two to seven. As a result, the estimate of simultaneously occupied sites increases and standard deviation drops (7.75±0.44). In total, 70% of total Late Iron Age sites could have been contemporary. For the same reasons, the average occupation span rises to nearly 2000 years (1935±107). The low rate of abandonment (half that of site establishment) and high proportion of type B sites suggest that Late Iron Age communities had a degree of continuity across both the preceding Early Iron Age and subsequent Roman period.

The total number of sites increases during the Roman period (from 11 to 16), and 53% of them (8.40±0.35) are contemporaneous, indicating relatively little flux. Much of this growth involves two-phase sites (span type A; three of 16) and single-phase sites (type D; five of 16). The number and proportion of three-phase sites (type B) drop somewhat (to five of 16). Together, these changes produce a mean use span of 420±17 years. A use span covering the entire period and a high number of contemporaneous sites despite a high proportion of single-phase sites indicate settlement stability.

Decline arrives during the Late Antiquity, when the site count drops to nine and the contemporaneous site estimate drops to 4.25±2.17. Some 47% of sites may be contemporaneous, but the high standard deviation (over half of the estimate) reveals instability in the settlement dynamics. The high count of span type A sites (seven

Table 15.1 Results of Dewar's model in the dataset of Yambol province sites (N=27)

		Occupation span type								
Period	*N*	*a*	*b*	*c*	*d*	*p*	*Eocc*	*Aocc*	*Mean Occ*	*Mean Use Span*
LBA	5	0	0	4	1	500	0.01	0.002	1.75±1.01	878 (373–1383)
EIA	15	2	2	5	6	500	0.022	0.016	5.21±0.70	332 (285–379)
LIA	11	0	7	2	2	500	0.008	0.004	7.75±0.44	1935 (1828–2042)
RM	16	3	6	2	5	400	0.018	0.02	8.40±0.35	420 (403–437)
LA	9	7	1	0	1	300	0.003	0.027	4.25±2.17	158 (77–238)
BYZ	1	1	0	0	0	300	–	0.003	0.53±0.27	177 (88–266)

Parameters used in the table include: Period – abbreviation of archaeological period (see 'Absolute chronology' *on page xiv), N – number of individuals within a period, a – number of sites in use in the preceding and the current period (X, Y), but not the following one (Z); b – number of sites used in the preceding, current, and following period (X, Y, Z); c – number of sites used only in the current and following period (Y, Z), but not the preceding one; d – number of sites used only in the current period (Y), but not the preceding or following period; p – length of the archaeological period in years; Eocc – number of sites established per year, Aocc – number of sites abandoned per year; Mean Occ – an estimate of the mean number of simultaneously occupied sites; Mean Use Span – an estimate of mean occupation length at sites during the period in question*

of nine), and high site abandonment rate (nine times the site establishment rate), indicate continuity with the previous period but little with the following. The mean use span falls by two-thirds to 158±81 years, marking the minimum site duration for the Yambol dataset and signalling a period of disturbance and unrest. This turmoil is historically attested in the Gothic and Avar invasions of the post-Roman period (Velkov 1983, 234). Archaeologically we see the abandonment of the veteran's colony at Stroyno (see Chapter 18), the establishment of the Late Antique fortress at Dodoparon (see Chapter 17), and the restoration and abandonment of Kabyle (Tancheva-Vasileva 1990, 145).

The number of sites decreases to one during the Early Byzantine period, at which point it is meaningless to generate any estimates. This depopulation reflects the status of Thracian Plain in the Early Byzantine period as a border zone contested between the Byzantine Empire and Bulgarian Kingdom (*cf.* the Great Fence of Thrace in Jireček 1888, 504–505; Runciman 1930, App. VI; Chapter 16 this volume).

The results of Dewar's method plotted in Figure 15.1 show that raw site count exaggerates the number of contemporaneous sites, sometimes by two or three times. The most extreme inflation occurs during periods with a high proportion of short-term occupations (span type D), such as the Early Iron Age, when only 35% of total sites (5.20 of 15) are estimated to be contemporaneous. During this period, 40% of sites are short-term (type D). The high site count of the Early Iron Age thus contains many ephemeral sites that were probably used temporarily or sequentially. As such, this peak does not represent expanding settlement. The inflation of site counts persists to a lesser degree during the Roman period, when the proportion of single-phase (type D) sites drops below one-third (5 of 16) and contemporaneous sites rise to about half of the total (8.40 of 16). The application of Dewar's model thus moderates Early Iron Age and Roman peaks in the raw site count (Fig. 15.1). It also eliminates the Late Iron Age decrease in site count, indicating instead continued growth in the number of contemporaneous sites. All told, a new trend emerges in the Yambol study areas of slow, continuous settlement growth from the Late Bronze Age through the Roman period, followed by decline during Late Antiquity and the Early Byzantine period.

Figure 15.2 illustrates changing patterns of site span types, represented as A-D sequences. These histograms visualise the variation in site span types over time, which Dewar calls the 'fingerprint' of settlement dynamics (1991, 616). The A-D sequences differ from one period to the next. Single-phase sites (type D) dominate the Early Iron Age, and are the second most common type in the Roman period. They are less common in the Late Bronze Age, Late Iron Age, and Late Antiquity, and absent from the Early Byzantine period. Three-phase sites (type B), by contrast, are prominent during the Late Iron Age and Roman period, less common during the Early Iron Age and Late Antiquity, and absent in the Late Bronze Age and Early Byzantine period. Two-phase sites indicating continuity with the succeeding period but not the preceding (type C) are prominent in the Late Bronze Age and Early Iron Age, present during the Late Iron Age and Roman period, but absent in Late Antiquity and the Early Byzantine period. Two-phase sites indicating continuity with the preceding period but not the succeeding (type A) dominate Late Antiquity and the Early Byzantine period, are less common during the Early Iron Age and Roman period, but are absent from the Late Bronze Age and Late Iron Age. The ratios of long-lived to short-lived sites and habitations varied over time, as did the underlying settlement dynamics.

15.2.2 *Estimating contemporaneous habitations in the Yambol province (functional restriction applied)*

Table 15.2 and Figure 15.3 show the results of Dewar's model applied only to sites that were designated as habitations. Subsetting reduces the total number of sites and estimated contemporaneous sites in all periods except the Early Byzantine (see Fig. 15.3). The mean occupation span tends to increase thanks to fewer single-phase sites (type D) in the habitation-only dataset (Fig. 15.4).

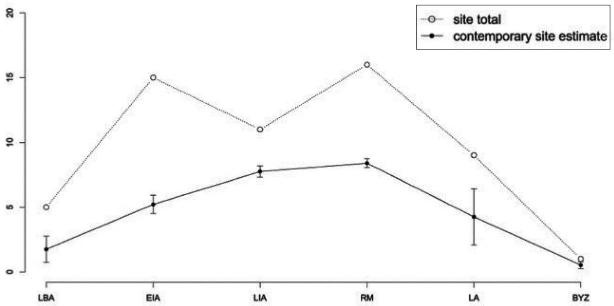


Figure 15.1 Count of total sites and estimated contemporaneous sites in Yambol from the Late Bronze Age through Early Byzantine period.

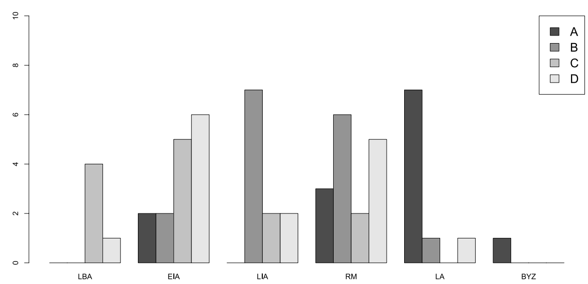


Figure 15.2 Patterns of Dewar's occupation span types A–D in the Yambol site dataset from the Late Bronze Age through the Early Byzantine period.

Table 15.2 Results of Dewar's model in the Yambol dataset of habitations (N=17)

		Occupation span type								
Period	*N*	*a*	*b*	*c*	*d*	*p*	*Eocc*	*Aocc*	*Mean Occ*	*Mean Use Span*
LBA	4	0	0	4	0	500	0.008	0	1.75±1.01	–
EIA	12	2	2	4	4	500	0.016	0.012	4.75±0.42	395 (360–430)
LIA	6	0	6	0	0	500	0	0	–	–
RM	10	1	5	2	2	400	0.01	0.008	6.20±0.11	775 (761–789)
LA	8	6	1	0	1	300	0.003	0.023	3.85±1.82	167 (88–246)
BYZ	1	1	0	0	0	300	0	0.003	0.53±0.26	178 (89–266)

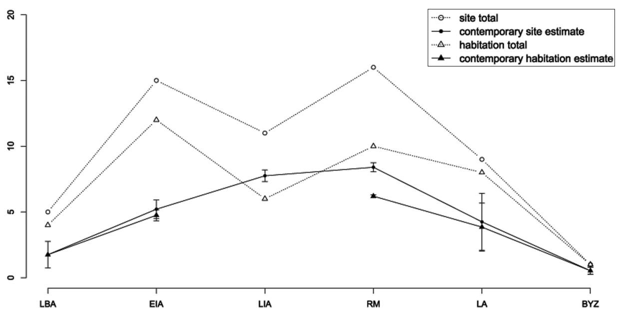


Figure 15.3 A comparison of counts versus estimates of contemporary sites and habitations in the Yambol province from the Late Bronze Age through the Early Byzantine period. Confidence interval is one standard deviation.

Functional restriction reduces the total site count most in the Roman period (16 to 10; 37%) and the Late Iron Age (11 to six; 45%), followed by the Early Iron Age (15 to 12; 20%), the Late Bronze Age (five to four; 20%), and Late Antiquity (nine to eight; 12%). While this downward adjustment is expected, since not all sites are habitations, the difference in the Roman period is especially notable, suggesting a large proportion of short-term or special-purpose sites. The small size of the habitation-only dataset reduces the reliability of estimates for the Late Bronze Age, Late Antiquity, and Early Byzantine period. The Late Iron Age also raises problems; it has only six habitations, all span type B, preventing calculation of a contemporaneous site estimate and mean use span.

Figure 15.3 illustrates that Dewar's estimates of contemporaneous habitations decline using the restricted dataset, but the estimates drop less dramatically than the raw counts. Contemporaneous habitations, except for the Late Iron Age and Roman period, remain within one standard deviation of the estimates of contemporaneous sites. Compared to unrestricted site results, the Early Iron Age loses perhaps one contemporaneous site (falling from 5.21±0.70 to 4.75±0.42, or 10%). The Roman period loses approximately two contemporaneous sites (8.40±0.35 vs. 6.20±0.11; 25%). Late Antiquity loses one to two contemporary sites (4.25±2.17 vs. 3.85±1.82; 10%). The Late Bronze Age and Early Byzantine period site estimates remain unchanged. The ratio of contemporaneous to total habitations (using the restricted dataset) tends to be higher than the ratio of contemporary to total sites (using the unrestricted). During the Early Iron Age, for example, contemporaneous habitations are 40% of the raw total (4.75 of 12), but contemporaneous sites are only 35% of the total (5.21 of 15). In the Roman period, contemporaneous habitations are 62% of total (6.20 of 10), but contemporaneous sites are only 52% of the total (8.40 of 16). Conversely, during Late Antiquity the ratio changes little; 48% of habitations are contemporaneous versus 47% of sites.

Restricting the Yambol dataset to only habitations reduces the raw counts and estimated contemporaries, while it increases mean use spans – similar to the effect of functional restriction using the Kazanlak datasets. Whether we use the restricted or unrestricted dataset, Dewar's estimates of contemporaneous sites or habitations also follow a different trend. The Early Iron Age and Roman period peaks in raw site numbers disappear. Instead, if we discard the null value in the Late Iron Age estimate of contemporary habitations, the trend of steady growth from the Late Bronze Age to the Roman period and decline thereafter appears in the restricted, habitation-only dataset, just as it did in the unrestricted site dataset.

If we compare mean use span between sites and habitations (Fig. 15.4), the habitations tend show a longer use span than sites, due to the elimination of shorter-term, special-purpose sites. In the Early Iron Age, average use span increases from 332±47 to 395±35 years. In the Roman period, average use span rises from 420±17 to 775±14 years. In Late Antiquity, it rises from 181±40 to 214±26 years. Early Byzantine use spans remain unchanged. Most of these differences, however, fall within one standard deviation of the corresponding calculations using the unrestricted site dataset (see Fig. 15.4 and Table 15.1). The only outlier is the Roman period, where sample restriction reduces single-phase habitations (type D) and increases the proportion of three-phase habitations (type B), inflating mean occupation span (775±14 years) to twice the duration of the entire period (ca. 400 years). This spike in average habitation span reveals some of the problems of a small sample size and an imbalance in the A-D site types (particularly between type D and type B in the habitation dataset). This imbalance was

worse in the restricted dataset because few short-term or ephemeral sites were designated as habitations, since they lacked architectural ceramics and functional variety in the artefacts. Note also that mean use span cannot be calculated for the Late Bronze Age and Late Iron Age, when a lack of occupation span types A and D produced a site abandonment rate of zero (see Table 15.2). This absence of type D sites also signals problems with the habitation sample, perhaps biased site recovery that missed short-term sites. The small size of the habitation-only dataset from Yambol reduces the utility of mean use span calculations, but functional restriction seems to increase the average use span of Yambol sites.

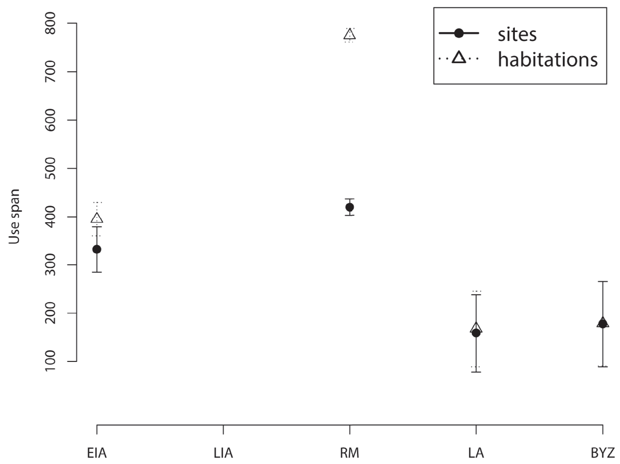


Figure 15.4 Comparison of the average use span between site and habitation datasets in Yambol. The error bars indicate a range of one standard deviation. The Early Iron Age through the Early Byzantine period, with the exception of Late Iron Age, are included.

Functional restriction appears to have little effect of the pattern of occupation span types over time (Fig. 15.5); the distribution of A-D sequences in the habitation dataset is similar to the distribution for sites. During the Late Bronze Age, two-phase habitations that continue into the subsequent period (type C) predominate. The Early Iron Age has a more balanced number of short- and long-term habitations. During the Late Iron Age and Roman period, three-phase habitations (type B) stand out. Two-phase habitations that continue from the previous period (Type A) are most common in Late Antiquity. This similarity in patterns of occupation span types over time, no matter which dataset is used, confirms that underlying changes in settlement dynamics can be seen in both habitations and sites. The most consistent difference between the restricted and unrestricted datasets is that fewer short-term occupations appear when only habitations are considered. The fundamental similarity between the datasets, however, indicates that sites are a reasonable proxy for settlements in Yambol, while the larger size of the site dataset makes it more useful.

15.3 Yambol: how much are we overcounting?

The short answer to the section title is that we are overcounting to a different degree depending on the period and the pattern of site span types (A-D). In both the unrestricted site dataset and the functionally restricted habitation dataset, patterns of A-D span types vary similarly through time (Fig. 15.5). We can characterise the degree of overcounting by expressing the number of estimated contemporaneous sites as a percentage of total site count for each period. This contemporaneous site percentage for Yambol is 35% during the Late Bronze Age and Early Iron Age, 70% during the Late Iron Age, 53% during the Roman period, and 47% during Late Antiquity. Overcounting is less acute in the

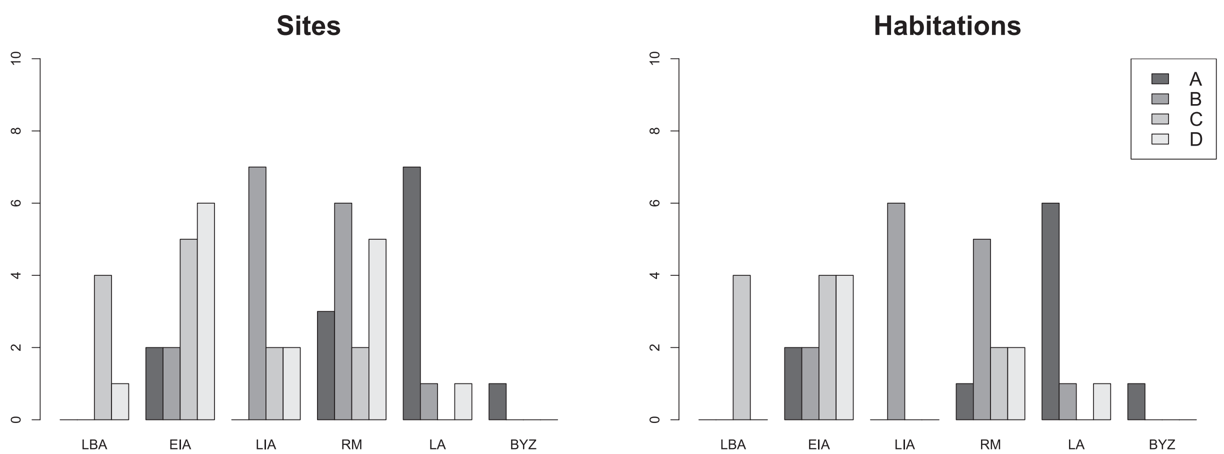


Figure 15.5 Patterns of Dewar's occupation span types A–D in Yambol site (left) and habitation (right) datasets from the Late Bronze Age through the Early Byzantine period.

functionally restricted dataset. Figure 15.2 shows that in the habitation dataset, contemporaneous site percentages increase to 40% in the Early Iron Age and 62% in the Roman period, and remain about the same at 48% during Late Antiquity (contemporaneous Late Iron Age habitations cannot be estimated due to the limitations of the restricted dataset). In both datasets, the site maps are most overpopulated during the Late Bronze Age and Early Iron Age, least overpopulated during the Late Iron Age, and somewhat overpopulated during the Roman period and Late Antiquity. All site maps and settlement pattern analyses should be evaluated in light of these changing rates of inflation.

15.4 Yambol and Kazanlak: regional differences in settlement dynamics

Despite differences in the Yambol and Kazanlak sample sizes, it is worthwhile to compare the results from the two regions. Results of such a comparison are more robust for the Early Iron Age, Late Iron Age, and Roman period, when the Yambol dataset is larger (N > 10). Using the unrestricted datasets, Yambol's total site counts are 68% of Kazanlak's in Early Iron Age (15 vs. 22), only 29% of Kazanlak's during the Late Iron Age (11 vs. 38), and 84% of Kazanlak's during the Roman period (16 vs. 19). The estimates of contemporaneous sites between the two regions vary differently (see Tables 9.1 and 15.1). Yambol's contemporary site count is only 53% of Kazanlak's during the Early Iron Age (5.21 vs. 9.74), 59% of Kazanlak's in the Late Iron Age (7.75 vs. 13.24), and 75% of Kazanlak's during the Roman period (8.40 vs. 11.20). In other words, correcting for contemporaneity increases the margin of Kazanlak's lead over Yambol in the Late Iron Age and the Roman period, but narrows it significantly in the Late Iron Age (even as Kazanlak total site count increases by 73%).

The number of contemporaneous sites in each region indicates different settlement trajectories. In Kazanlak, the estimated number of contemporaneous sites starts at 9.74 in the Early Iron Age, peaks at 13.24 in the Late Iron Age, then decreases to 11.20 in the Roman Period (and continues declining thereafter, see Table 9.1 and Fig. 9.4). In Yambol, the estimated number of contemporaneous sites rises steadily, from 5.21 in the Early Iron Age, to 7.75 in the Late Iron Age, to 8.40 in the Roman period (before falling thereafter, see Table 15.1 and Fig. 15.1). The apex of settlement is thus the Late Iron Age in Kazanlak, versus the Roman period in Yambol.

The percentage of total sites estimated to be contemporaneous again represents a useful metric, one that also reveals differences in settlement dynamics between the two regions. In Kazanlak, Dewar's model estimates that 44% of the Early Iron Age sites were contemporaneous, decreasing to 35% during the Late Iron Age, and increasing to 49% during the Roman period. In Yambol (as discussed above), 35% of Early Iron Age sites were contemporaneous, rising to 70% during the Late Iron Age, and falling to 53% during the Roman period.

Differences in contemporaneous site percentage signal differences in settlement dynamics. In Kazanlak, the Early Iron Age and Roman period have the highest percentage of total sites estimated to be contemporaneous (44% and 49% respectively), indicating periods that favoured longer-term settlement. In the Late Iron Age, the contemporaneous site percentage drops to 35%, indicating a period of relatively short-term settlement and mobility. In Yambol, the Early Iron Age has the lowest percentage (35%). The Late Iron Age and Roman period have higher percentages (70% and 53% respectively). During both of these periods, but especially the Late Iron Age, Yambol communities favour long-term settlements with greater continuity. The difference between the two regions is most pronounced during the Late Iron Age, when the contemporaneous site percentage is twice as high in Yambol as it is in Kazanlak (70% vs. 35%). The Late Iron Age is a period of short-term settlement in Kazanlak, but long-term in Yambol.

The percentage of total sites estimated to be contemporaneous converges in the Roman period (49% in Kazanlak vs. 53% in Yambol). The percentage of single-phase (type D) sites is also similar (26% in Kazanlak vs. 31% in Yambol) at this time across both datasets. We can imagine a Roman landscape where two-thirds to three-quarters of sites are long-term habitations, and one-quarter to one-third are short-term settlements or special-purpose areas. This convergence could indicate that Roman communities in Kazanlak and Yambol utilised the landscape in similar (standardised) ways, producing similar footprints – as might be expected as both regions were incorporated into the administrative and economic systems of the province of Thrace in the Roman Empire. The similarities between the two regions during the Roman period, however, might also be the product of survey bias. Roman ceramics may have been produced and discarded at a higher rate than earlier periods. Roman pottery is also more obtrusive, standardised, and diagnostic, making recovery and identification easier. Either of these factors could have led to higher recovery rates or better chronological and functional identification of Roman sites. Further investigation, with larger survey areas and additional comparanda, will be required to determine whether survey bias is responsible for similarity between Kazanlak and Yambol, or a genuine convergence in human behaviour brought about by Roman rule.

15.5 Conclusions

The application of Dewar's model to the site dataset in Yambol shows that raw site totals overstate the probable number of contemporaneous sites and habitations by 30–65%. The degree of overcounting differs by period. It is greatest during the Late Bronze Age and Early

Iron Age, and lowest for the Late Iron Age. If Dewar's estimates of contemporaneous sites are used instead of total site counts, the Early Iron Age peak in site count disappears, and a new trend emerges of gradual settlement growth from the Late Bronze Age through the Roman period, after which settlement declines. Division of sites by occupation span type confirms that different settlement dynamics governed each of the seven chronological periods. If the site dataset is restricted to habitations, the number of contemporary settlements decreases by 10–25%, but the average site occupation span increases. While contemporaneous habitations have lower counts than contemporaneous sites, the same trend of gradual growth from the Late Bronze Age through the Roman period and subsequent decline is visible. Functional restriction does not have a major impact on estimates of contemporaneity; the unrestricted site dataset is a good proxy for settlement, and its larger size offers better results. If we compare Kazanlak and Yambol, the percentage of total sites estimated to be contemporaneous changes over time, as does the proportion of occupation span types, suggesting different settlement dynamics. The Late Iron Age shows a remarkable divergence between short-term settlement in Kazanlak versus long-term settlement in Yambol, while the Roman period shows a convergence towards settlement stability across both study areas. Overall, estimated contemporaneous sites comprise some 35–70% of total sites in Yambol and 35–53% in Kazanlak, indicating somewhat more site overcounting in Kazanlak, and somewhat greater settlement stability in Yambol.

15.6 R code repository

For code used to generate the results see: https://github.com/adivea/RScripts

16

Spatial variability in surface artefact distributions in the Yambol study areas

Adela Sobotkova

Abstract *This chapter discusses the results of spatial analysis conducted on surface survey data from the Yambol study areas of the Tundzha Regional Archaeology Project (TRAP). In the rolling landscape of the Middle Tundzha River watershed, tributary valleys serve as zones of settlement, contributing to east-west settlement systems. Elevated ridges between the tributary valleys host mortuary landscapes. These linear systems pose a challenge to quantified assessment of aggregation and dispersal due to their single dimension, and so this study focuses on rates of growth, site spacing, and hierarchy. Given the ubiquitous presence of productive soils in the tributary valleys and the lack of topographic obstacles, economic and social factors emerge as the main drivers of settlement. Historical settlement dynamics change in response to internal and external socio-economic stimuli. An Early Iron Age rise in site counts is similar to that seen in Kazanlak. After the number of sites decline in the Late Iron Age, the Roman period sees the apex of settlement. Functional differentiation is attested in stratified urban and rural sites, while surface artefacts signal that local communities engaged in crafts and commerce. After Roman-era growth abates, settlements decline during the Late Antique and Early Byzantine period. Recovery during the Mediaeval period sees a different settlement pattern established, where only a few permanent sites sit amidst an agricultural hinterland. During the Ottoman period habitations relocate to their modern placement outside of the study areas.*

Keywords *spatial statistics; linear settlement patterns; diachronic settlement patterns; population dynamics; cultural and environmental history*

16.1 Introduction

This chapter explores how past communities in the Yambol study areas interacted with each other and surrounding landscape over the last 6,000 years, and sheds light on the factors governing site numbers, spacings, and sizes. In broad strokes, the long-term settlement trends in Yambol are aligned with Kazanlak (compare Figs. 16.1 and 10.1), although specific periods offer considerable variation. Figure 16.1a shows the relative stability of the Neolithic to Early Bronze Age settlement capped by the Middle Bronze Age hiatus. Growth occurs from the Late Bronze Age through the Roman period, aside from a decline during the Late Iron Age (a decrease in settlement that contrasts with Late Iron Age Kazanlak). Prosperity declines after the Roman period, with settlement reaching a minimum during the Early Byzantine period. After this low point, the Mediaeval period sees a partial revival, and Ottoman times yet more growth.

The Yambol study areas contrast with Kazanlak in that they display a series of one-dimensional, linear settlement patterns along the tributaries of the Tundzha River. Survey data from both the Elhovo and Dodoparon study areas illuminate the social and environmental factors that drive spatial variation in settlement location over time. Locational theory underpins the analysis of Yambol surface distributions in this chapter (Haggett *et al.* 1977; Burghardt 1959; Allee 1949; Duncan 1991). Given the small size of the Yambol study areas, edge effects combine with linear settlements patterns to inhibit quantitative assessment of site clustering at multiple scales. Instead, I investigate site count, spacing, size, and position as they relate to environmental context and inter-site competition in linear systems (Alee 1949, 516; Duncan 1991). My aim is to shed light on diachronic population trends, settlement preferences, and social organisation in the Thracian Plain.

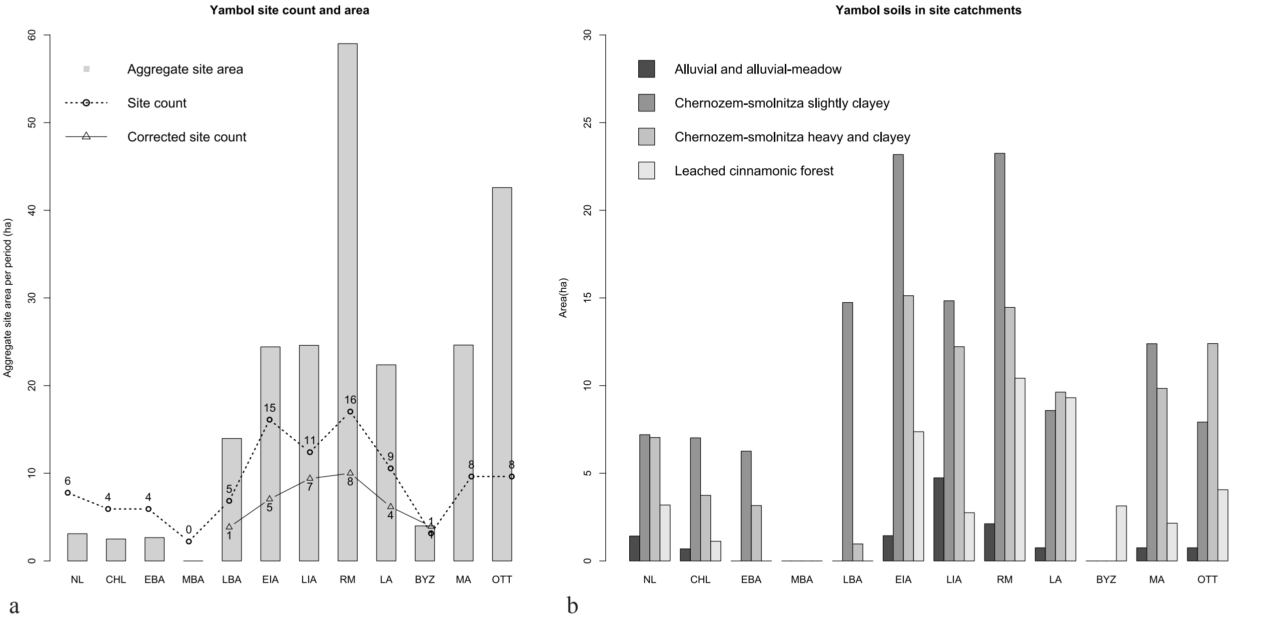


Figure 16.1 Overview of results for the Dodoparon and Elhovo study areas: a) site counts, aggregate area, and estimates of contemporaneous sites from the Neolithic to the Ottoman period, b) soil types in a 1 km catchment around sites over time.

16.1.1 Analysing linear settlement systems

Unlike in the Kazanlak Valley, where the surrounding mountain ranges bound settlement systems, settlements in the Yambol study areas are not as topographically constrained. They are positioned along the east–west tributaries of the Tundzha River in a mostly open, rolling landscape. Linear settlement patterns along river systems are common, but are not amenable to two-dimensional geostatistical analysis such as Nearest Neighbour or Ripley's K. Hodder and Orton (1976, 43, citing King 1962) point out that linear patterns visible to the naked eye can yield coefficients indicating random arrangement when using Nearest Neighbour analysis. This situation occurs in the Yambol samples; most geostatistics analyses yield uniform or dispersed results (*i.e.*, they fail to detect clearly visible patterns), because sites lay along the rivers that form the boundaries of our study areas.

Since linear patterns limit spatial analysis, spacing and hierarchy must be explored using other methods. Environmental suitability (*e.g.*, proximity to water, fertile soils, or other resources), proximity to communications routes, and competition (or cooperation) between sites explain much of the pattern. Flannery (1976, 173) provides a list of questions that archaeologists might ask about linear systems, especially those on waterways, some of which I address below.

What rules govern the choice of a particular riverbank for settlement? While communities may settle near rivers to access well-watered land, their choice of location along a river may also relate to other factors, like the presence of wild game, woodlands, or other resources. A purely agricultural model may overlook such factors. Burghart (1959) explored the choice of one riverbank versus the other in a study of settlements along large Midwestern US rivers. He articulated a set of rules for riverside settlement, the most relevant of which is that of 'local factors being equal, the side of the river chosen by a town may depend on where its more distant sustaining hinterland is located' (1959, 305). Exploration of this theme is limited in Yambol, as TRAP survey only included one bank of each of the three rivers in the study areas.

What factors determine the spacing between sites sharing the same river? In the process of colonising a linear system, daughter communities are founded between the original mother communities until a spacing

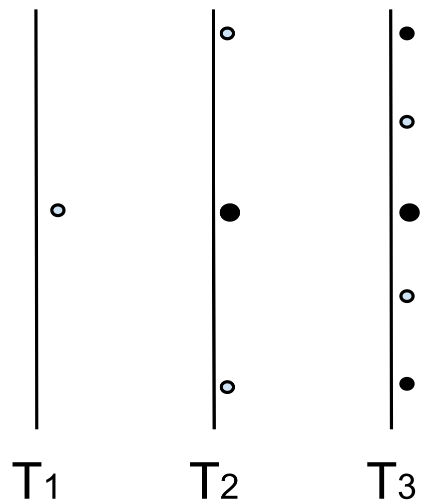


Figure 16.2 Illustration of settlement infilling along a linear pattern. After Flannery 1976.

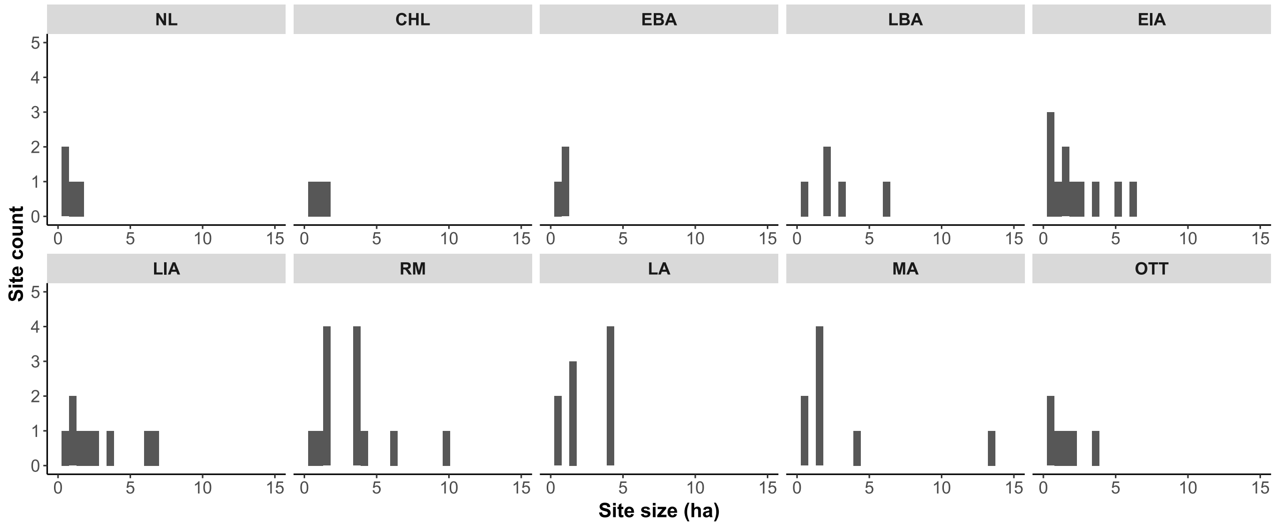


Figure 16.3 Site size histograms from the Neolithic through the Ottoman period, using 0.5 ha bins. One outlier has been omitted (Ottoman site 7008 covers 33.4 ha).

threshold – a minimum interval between sites determined by either environmental or social factors – is reached. Breaking the process into successive stages, we expect second-generation communities to be founded midway between the original parent communities, with a third generation later founded midway between the second-generation communities (see Fig. 16.2). This process will continue until a minimum spacing threshold is reached. A variety of environmental and social factors govern minimum spacings, including the sufficiency of resources for subsistence, site intervisibility, or inter-site competition.

What relationship exists between neighbours on opposite sides of a river? Depending on the size of the river and its effectiveness as a barrier, they may be either independent competitors or subsidiary settlements, like ports, waystations, or outposts. How then is competition in linear systems that have no 'centre' assessed? Burghardt proposed two principles governing competition between riverbank towns. The first states that if the original town in a given locale developed on the more favourable bank, no competitor would arise across the river. If the community emerged on the less favourable bank, however, a competitor was likely to emerge opposite, often superseding the initial settlement eventually. The second rule suggests that larger river towns show an interesting uniformity of spacing along the river, one which 'may be considered to be a variation on the central place location of towns' (1959, 322; cited in Flannery 1976, 174). While Flannery can test both Burghardt's rules in his Mesoamerican case study, the lack of the opposite-bank site information in the Yambol surveys impedes this kind of analysis. Only during the Ottoman period can we cautiously consider both riverbanks, relying on the location of modern villages.

16.1.2 *Presenting site data in Yambol*

The two study areas encompass a range of topographic zones – river terraces sloping up to a ridgeline bounded by streams to the north and south in the case of Elhovo, or rolling terrain around a prominent hill bounded by a stream to the north in the case of Dodoparon (see Chapter 11). Most sites are concentrated within a narrow strip of land near the streams, where *smolnitsa* soils predominate. Barplots in Figure 16.1b show the soil types available in 1 km catchments around Yambol sites, producing an overview of the sites' immediate resources. The catchments were generated using a Euclidean buffer. Tobler's hiker's cost-distance algorithm might have produced more realistic catchment sizes, since it incorporates walking time and considers the difficultly of terrain. In the case of the Yambol survey areas, however, a faithful replica of friction surfaces seemed unnecessary, since most terrain was easy to cross. Euclidean buffers therefore seemed adequate for an initial consideration of resource availability and its impact on settlement preferences.

Site size histograms (Fig. 16.3) and digital site distribution maps categorised by period provide an overview of survey data.[1] When comparing Kazanlak (Chapter 10), note the change in the divisions between site size ranks. The 1 ha threshold between tiny and small sites feels more arbitrary in Yambol than in Kazanlak, as most Yambol histograms show a more meaningful break at 2 ha. Because of this natural breakpoint, 0.5, 2, 5, and 10 ha tiers are used in the Yambol site tables and distribution maps.

16.2 Neolithic to Early Bronze Age

TRAP recorded nine sites, including seven surface concentrations and two tells, with materials dating from

Table 16.1 Yambol site aggregate area, count, and average area over time

Period	*NL*	*CHL*	*EBA*	*LBA*	*EIA*	*LIA*	*RM*	*LA*	*BYZ*	*MA*	*OTT*
Aggregate Area (ha)	3.1	2.5	2.7	14	24.4	24.6	59	22.4	4	24.6	42.6
Site Count	6	4	4	5	15	11	16	9	1	8	8
Avg Area (ha)	0.5	0.6	0.7	2.8	1.6	2.2	3.7	2.5	4	3.1	5.3

Table 16.2 Yambol site count by size rank over time

Site ranks/site count	*NL*	*CHL*	*EBA*	*LBA*	*EIA*	*LIA*	*RM*	*LA*	*BYZ*	*MA*	*OTT*
Tiny (<0.5 ha)	4	2	2	1	6	3	3	1		2	2
Small (0.5–2 ha)	2	2	2	2	5	3	5	4		4	4
Medium (2–5 ha)				1	3	3	5	4	1	1	1
Large (5–10 ha)				1	1	2	2				
XL (>10 ha)							1			1	1

Table 16.3 Yambol site aggregate area by size rank over time

Site ranks/total area	*NL*	*CHL*	*EBA*	*LBA*	*EIA*	*LIA*	*RM*	*LA*	*BYZ*	*MA*	*OTT*
Tiny (<0.5 ha)	1.2	0.4	0.5	0.4	1.2	0.6	0.6	0.4		0.7	0.6
Small (0.5–2 ha)	1.9	2.1	2.1	3.9	6.3	2.9	7.8	6.0		6.5	5.2
Medium (2–5 ha)				3.3	10.9	8.3	18.0	16.0	4.0	4.3	3.4
Large (5–10 ha)				6.4	6.0	12.8	15.7				
XL (>10 ha)							16.9			13.2	33.4

Table 16.4 Yambol site average area by size rank over time

Site ranks/avg area	*NL*	*CHL*	*EBA*	*LBA*	*EIA*	*LIA*	*RM*	*LA*	*BYZ*	*MA*	*OTT*
Tiny (<0.5 ha)	0.3	0.2	0.3	0.4	0.2	0.2	0.2	0.4		0.4	0.3
Small (0.5–2 ha)	1.0	1.1	1.1	1.9	1.3	1.0	1.6	1.5		1.6	1.1
Medium (2–5 ha)				3.3	3.6	2.8	3.6	4.0	4.0	4.3	3.4
Large (–10 ha)				6.4	6.0	6.4	7.9				
XL (>10 ha)							16.9			13.2	33.4

Table 16.5 Nearest Neighbour index of Yambol sites over time

Period	*NL*	*CHL*	*EBA*	*LBA*	*EIA*	*LIA*	*RM*	*LA*	*BYZ*	*MA*	*OTT*
Ratio	2.59	3.097	2.79	2.07	1.39	1.59	1.66	1.42	–	1.84	1.93

the Neolithic to the Early Bronze Age. Two of these sites (6034, 6036) lay in the Dodoparon study area, the rest in or near the Elhovo study area. The two tells (8019, 8025) yielded more than 10 diagnostic sherds. The two tells, although legacy sites situated about 2 km outside the Elhovo study area, were included because they are well known, and key to understanding settlement patterns in the study area.

The Neolithic to Early Bronze Age concentrations produced worn material that was often ambiguous and difficult to assign to a specific period. Concentration 6018 (a multi-component site occupied until the Roman period) yielded over 10 sherds, but their attribution remains uncertain. Some sites, such as concentration 6026, had a low density of artefacts that included handmade pottery possibly dating to the Neolithic or Early Bronze Age, but that was also difficult to date. Still other early artefacts were found within large, multi-component scatters, often in the form of highly fragmented shards discovered during total pickup. The identification of Neolithic site components remains the most tentative due to the low frequency and severe wear that characterised Neolithic pottery. The exceptions were prominent sites such as the tell of Konevetz (8019), or single-component concentrations such as 8021. Chalcolithic pottery, conversely, was highly diagnostic (*e.g.*, at 8011), while

Bronze Age was somewhat more common (*e.g.*, at 6036); both were identified during survey with less difficulty than Neolithic. The low frequency and poor survival of handmade compared to wheel-made pottery meant that little functional differentiation was apparent in the oldest surface concentrations. We believe most sherds came from habitations, which ranged in size from single structures (*e.g.*, 6026) to small villages (*e.g.*, the tells). The Early Bronze Age activity area 6027 had a very limited range of finds, containing sherds of a single jug and a large quartz bead with a drilled hole. These finds, without traces of building materials or other wares, may have had a more ephemeral mortuary or ritual purpose.

16.2.1 Change and continuity from the Neolithic to the Early Bronze Age

Six Neolithic sites were documented, including five surface concentrations (6018, 6026, 6036, 8011, 8021) and tell Konevetz (8019) (see Fig. 16.1 and digital map).[2] The extent of Neolithic components at surface scatters ranged from 0.1 to 1.3 ha, falling into the smaller (*i.e.*, 'tiny', < 0.5 ha, and 'small', 0.5–2 ha) size ranks ('NL' column, Tables 16.2–16.4). The aggregate area of all identified Neolithic sites within the two study areas is 3.1 ha, which makes the average site just over 0.5 ha (Table 16.1). The low aggregate site area (0.1% of the total study area) results from burial by deposition, severe wear of surface materials, and poor definition of these early components in multi-component surface artefact concentrations. For comparison, excavated tells in the Middle Tundzha River watershed, such as Drama Merdzhumekya (Lichardus *et al.* 2000), cover ca. 1 ha, typical of small Neolithic settlements from across Bulgaria and not that different from our average site size.

Chalcolithic remains were documented at four sites: three surface concentrations (6034, 8011, 8021) and the Kamenetz tell (8025) (see Fig. 16.1 and digital map).[3] Three of these sites lay in or near the Elhovo study area (8011, 8021, 8025), while the last was in the Dodoparon study area (6034). Only the tell produced more than 10 diagnostic sherds; other distributions produced only a few (see the counts of diagnostic sherds in online resources).[4] Two of the surface concentrations have Neolithic predecessors (8011, 8021), while Chalcolithic pottery represents the earliest component of the others (6034, 8025). In the case of 6034, Chalcolithic remains are some 500 m away from a Neolithic site (6036), which may indicate a relocation of the community. The size of Chalcolithic components ranges from 0.2 to 1.1 ha, again constrained to the two smallest site tiers, with an average area of 0.6 ha and an aggregate area of 2.5 ha (Tables 16.1–16.4).

Four sites produced Early Bronze Age pottery: three concentrations (6026, 6027, and 8011) and the Kamenetz tell (8025), all in or near the Elhovo study area (see digital map).[5] Again, only the tell produced more than 10 diagnostic sherds; flat sites yielded fewer. Two of four Early Bronze Age sites had Chalcolithic predecessors (8011, 8025), while two new sites appeared (6026, 6027). The only Chalcolithic site in the Dodoparon study area (6034), and one site in the Elhovo study area (8021), both went out of use. The extent of the Early Bronze Age components ranges from 0.1 to 1 ha, averaging 0.7 ha and totalling 2.7 ha (Table 16.1, column four). These figures are similar to the Chalcolithic in terms of site rankings, count, average size, and aggregate area. As with other early periods, we may be underestimating the number and area of Early Bronze Age sites due to burial via deposition and degradation of surface material.

We see some differences in settlements between the Chalcolithic and Early Bronze Age: two sites are abandoned, two are established, and two continue to be in use. Taken together, however, the settlement footprint remains essentially the same, indicating a great degree of continuity. The change seen between the Neolithic and Chalcolithic represents a more interesting problem. Four of six sites go out of use (6018, 6026, 6036, 8019), while only two are founded (6034, 8025), resulting in a total of four sites. While one tell settlement is abandoned (8019), another comes into use (8025). Together, these changes indicate some degree of community relocation. Not only do site numbers decline, but so does aggregate area (from 3.1 to 2.5 ha), indicating population decline or post-depositional processes favouring the exposure of Neolithic layers. Neolithic pottery, however, is generally less obtrusive than that of the following periods. Chalcolithic pottery is especially visible and relatively easy to identify (for prehistoric material). If material obtrusiveness or observer bias played a major role in site discovery, we might expect fewer Neolithic and more Chalcolithic sites. Likewise, earlier periods should suffer most from burial and other post-depositional processes, again disadvantaging the Neolithic remains. The higher count and larger area of Neolithic sites means either that some counter-intuitive post-depositional process contributed to their exposure, or that community behaviour (*e.g.*, site relocation or abandonment) explains the decline in site numbers. The abandonment of a Neolithic tell (8019), the abandonment of two flat sites (6026 and 6018), the shift of one site (6036) to a new location (6034), and the establishment of a new tell (8025) combined to produce the new settlement pattern. The decrease from six Neolithic to four Chalcolithic sites is suggestive, but because of the small size of areas studied and the limits of the resulting dataset, it is difficult to assess the significance of the decrease or determine if the situation represents broader population changes (*e.g.*, decline or dispersal) during the Chalcolithic.

16.2.2 Topography and soils

The Yambol study areas are not amenable to environmental zoning in the same way as the Kazanlak study area. Palaeoecology depicts a landscape of open woodland with plentiful water sources during the Neolithic, Chalcolithic, and Early Bronze Age (see Chapter 11 and Chapter 13).

The rolling landscape provided variety. Elevated locations offered protection from flooding, and slopes presented drained soils amenable to hoe agriculture. Patches of woodland provided their own resources. Ridgelines and outcrops offered stone and metal resources. Specific locations within the study areas thus differ in proximity to water, in slope and aspect, and in access to a variety of other resources. They vary less than Kazanlak, however, in topography and soil type or fertility.

The Neolithic communities in the Yambol study areas set the pattern for locational preferences (see Chapter 14). Neolithic sites are located near Tundzha River tributaries, on fertile slopes with well-drained but humic soils, within an hour's walk of the nearest stone outcrop (*e.g.*, 8019, 6026, 6018). Chalcolithic sites also lay on the slopes of the ridges in the study area, but new foundations (6034, 8025) were further from the Tundzha tributaries (in the Elhovo and Dodoparon studies areas respectively) compared to their Neolithic predecessors. Early Bronze Age communities in the Elhovo area continue to retreat eastward away from the Tundzha, while disappearing completely from the Dodoparon study area. Sites 6026, 6027, and 8011, for example, are further from the Tundzha, but remain close to the Gerenska and Dereorman Rivers. The village at 8025 is positioned the highest (229 masl) and furthest from any water.

The soils within a 1 km catchment of prehistoric sites include a combination of lighter and heavier *smolnitsas*, with occasional forest soils (see the first three barplots in Fig. 16.1b). Heavy alluvial (riverine) soils are absent (except around 8019). The soil ratios remain the same from the Neolithic through the Early Bronze Age, indicating similar resources and environments were available and useful to local communities. The consistent preference for sloped locations near water, against the backdrop of a diverse landscape, points to intentional selection. The retreat from the Tundzha River in the Elhovo study area after the Neolithic may represent a local response to flood risk or other dangers associated with the river.

16.2.3 Spatial patterns and site hierarchies

Judging the spatial distribution of sites by eye, Yambol sites appear widely dispersed during the early periods. Neolithic sites occur at intervals of 4 to 5 km, with little intervisibility. Intervals between Chalcolithic sites are 3 to 10 km, acknowledging the impact of edge effects and small sample size. In the Early Bronze Age, site spacing ranges 5 to 6 km. In the Elhovo area, there is a shift in site locations to the east, away from the Tundzha River. From the Chalcolithic to the Early Bronze Age, the territory between sites (especially 8021, 8011, and 8025) begins to fill in, with one daughter settlement established on each tributary. The fact that the study areas include only one bank of each relevant stream limits analysis of settlement dispersal, and casts doubt on the low site count during the Chalcolithic and Early Bronze Age, as undiscovered flat sites could lie beyond the study area boundaries.

Table 16.2 shows that most Neolithic to Early Bronze sites fall into the 'tiny' rank (< 0.5 ha), with and few in the 'small' rank (0.5–2 ha). Among the Neolithic sites, only 8011 and 6034 exceed 0.5 ha. The higher frequency and greater diversity of material in concentrations 8011 and 6036 mark them as settlements, as is the tell (8019). Other sites, which produced only a few shards, may represent shorter-term settlements or activity areas; the lack of subsurface exploration makes any evaluation tentative. Among the Chalcolithic components, 8011 remains the largest concentration, followed by 6036 (both ca. 1 ha). Concentrations 8021 and 8025 are smaller (< 0.5 ha). The differences in site area could be the result of artefact dispersal combined with later site reuse, since the area of older site components is consistently greater in multi-component sites. Besides the new tell (Kamenetz; 8025), and site 8011 (where a dense scatter of daub and pottery indicated habitation), the sparser remains at other concentrations (6034, 8021) have been designated as activity areas. During the Early Bronze Age, tell Kamenetz (8025) reaches its largest area, probably burying evidence of earlier periods. Concentration 6026 contained storage ware and construction materials, provisionally assigned to a single structure. Occupation at 8011 and 6027 remains uncertain; both sit in the smallest site tier (< 0.5 ha). Among Early Bronze Age concentrations, 6027 marks a (likely ephemeral) special activity area; finds included fragments of a single jug and a large, perforated crystal bead.

The stratification of long-term sites (tells), shorter-term 'flat' sites (*e.g.*, 6026), and activity areas (*e.g.*, 6027) point to incipient functional differentiation by the Early Bronze Age. The dispersed character of sites and their small size have several potential explanations. Scalar stress and fissioning could have instigated the foundation of new sites (Parkinson 2006). This proposition could be tested with stylistic analysis at different geographic and social scales, from the present study areas to the region as a whole.

16.3 Late Bronze Age to Late Iron Age

The Middle Bronze Age in the Yambol study areas was as elusive as in the Kazanlak Valley. Only in the Late Bronze Age do local communities become archaeologically visible again. Assessing change over the Middle Bronze Age gap is complicated by the fact that two concentrations could only be dated broadly to the Bronze Age, with no further chronological resolution possible.

Securely dated Late Bronze Age materials included a range of handmade storage, cooking, and serving vessels, as well as associated food processing implements like grinding stones and pestles. Early Iron Age concentrations show similar assemblages, but with distinct decoration styles. Most Early Iron Age sites were identified on the basis of local handmade pottery, especially stamped ware and other types with incisions, stamps, plastic attachments, and similar diagnostic decoration (Chichikova 1972). The arrival of wheel-made pottery in the sixth to fourth

century BC marks the transition between the Early and Late Iron Age (*e.g.*, at 6034 and 6036). While imports are limited to amphorae, many serving vessels have a dark slip suggesting that they imitate Greek black slip (Bozhkova 2002, 1992). Grey ware vessels, common in Kazanlak, were rare in Yambol.

16.3.1 Change and continuity from the Late Bronze Age to Late Iron Age

Late Bronze Age materials were documented at five surface concentrations, four in the Elhovo study area (6018, 6026, 6027, 8011) and one in the Dodoparon study area (6036), representing an increase of one site over the Early Bronze Age (see digital map).[6] Three Early Bronze Age sites remain in use (6026, 6027, 8011), while two new sites appear (6036 and 6018, noting that both had previously been occupied in the Neolithic). The tell occupied during the Early Bronze Age (8025) was abandoned. The size of Late Bronze Age sites ranges from 0.4 to 6.4 ha, with the upper extent marking a significant increase over previous periods (Tables 16.2–16.4). The five sites together have an aggregate area of 14 ha and an average area of 2.8 ha – both figures represent a fourfold or fivefold increase over earlier aggregate and average areas (Table 16.1). Late Bronze Age materials are more plentiful and dispersed over larger areas. Except for 6026 and 6027, most sites have later components, signalling continuity. A modest increase in site count and a large increase in aggregate site area indicate the growth of settlements. Settlement could be larger due to either a lower-density of dwellings at Late Bronze Age sites compared to those of the Early Bronze Age, increasing population, or both.

Fifteen concentrations (three in the Dodoparon study area and 12 in the Elhovo study area) produced Early Iron Age materials, three times as many as yielded Late Bronze Age artefacts (see digital map).[7] Four of five Late Bronze Age sites remained in use during the Early Iron Age (6018, 6026, 6036, 8011). In eight cases, however, only a few diagnostic Early Iron Age sherds were found.[8] These sherds offer unambiguous dates, but their scarcity makes the existence of Early Iron Age settlements in these locations uncertain. One such case is the Roman fortress at Dodoparon (8024), where a single Early Iron Age sherd was discovered, probably in a secondary context. The other seven sites produced larger amounts of Early Iron Age materials, including stamped or burnished handmade fabrics (alongside other ceramics, daub, and lithics). Diagnostic sherds remained scarce, rarely exceeding 10 fragments at any given site. In extent, the Early Iron Age sites range from 0.1 to 6 ha, with an average size of 1.6 ha – somewhat smaller than Late Bronze Age sites, which averaged 2.8 ha (Tables 16.1–16.4). Since there are three times as many sites, however, their aggregate area grows from 14 to 24.4 ha. In short, Early Iron Age sites are more numerous, but smaller, than their Late Bronze Age predecessors, indicating a process of site dispersal and community fissioning.

Late Iron Age material was found at 11 sites, nine in the Elhovo study area and two in the Dodoparon study area.[9] At seven of these concentrations (6034, 7019, 8005, 8011, 6037, 6038, 8026), the Late Iron Age date was confirmed by the presence of imported amphorae, primarily from Chios, and Thasos. Black Sea amphorae, whose dates span from Late Iron Age to the Roman period, were found at eight concentrations, (6034, 7019, 8005, 8011, 8012, 6037, 8026, 6038). Imitation black slip (6034, 6037) or early (?) red slip (6034, 7019, 8011, 6018) contributed to dating. A pre-Roman component is inferred at four more distributions (6021, 7020, 8005, 8012) based on the presence of Black Sea amphorae. Seven concentrations are horizontally stratified, with Early Iron Age predecessors (6018, 6021, 6034, 7019, 7020, 8011, 8012). Sites continue to occupy locations on riverbanks or terraces and the slopes above them, including two new foundations at the west end of the Elhovo study area, closer to the Tundzha River (6038, 8026). While the number of sites decreases from 15 in the Early Iron Age to 11 in the Late Iron Age, the loss mostly affects smaller sites, leading to an increase in average site extent from 1.6 to 2.2 ha (Tables 16.1–16.4). Aggregate site area remains about the same (24.6 ha in the Late Iron Age versus 24.4 ha in the Early Iron Age), as the increase in average site size offsets the decrease in numbers. If Dewar's estimates of contemporary sites are used, however, the Late Iron Age decline in site count disappears, replaced by continuing growth from one Late Bronze Age site, to five Early Iron Age sites, to seven Late Iron Age sites (Fig. 16.1a).

16.3.2 Topography and soils

Late Bronze Age, Early Iron Age, and Late Iron Age sites occur in environments similar to earlier periods, dispersed at regular intervals along river terraces and the slopes above. North-facing slopes show a greater density of sites as settlement expands during the Early Iron Age in both Elhovo and Dodoparon areas. Preferred locations allow inhabitants to exploit riverine environments and some of the best arable land available (it is better drained than the heavier, clayey soils in the immediate vicinity of the Tundzha River). The preference for rich but easily worked soils near sources of water indicates that the communities of the Late Bronze Age, Early Iron Age, and Late Iron Age had a mixed agricultural economy (Fig. 16.1b).

Defence appears not to govern the choice of site locations in the Yambol study area, although residents visited elevated areas. A characteristically decorated Early Iron Age sherd discovered at Dodoparon (8024) indicates some activity took place at this elevated site, yet no evidence of fortifications or permanent settlement dating to the Iron Age was found during trial excavations (see Chapter 19). To the extent that Iron Age people used the location, it could have been a temporary or seasonal base,

serving as a refuge (Xen. *Anab.* 7.4), a foraging zone, or a place for meetings, feasts, and exchange during festivals (Domaradzki 1986).

16.3.3 Site types

As the number of concentrations expands from the Late Bronze Age to Early Iron Age, sites grow more functionally differentiated. The most frequent site type is a farmstead or hamlet, a settlement whose inhabitants are dedicated to farming. Farmsteads and hamlets differ in size and population, but they produce similar assemblages indicating food processing, storage, and consumption, as well as evidence of permanent habitation. Handmade storage vessels, burnt cookpots, tableware-like drinking cups and bowls, grinding stones, pestles, and building materials like daub all appear in the surface assemblages associated with these agricultural settlements. The composition of assemblages and the technical and stylistic execution of the ceramics were consistent from one concentration to another, down to the character of decorative motifs (bird and circle stamps), suggesting shared technical knowledge and ongoing contact amongst these settlements.

Another site type is characterised by its small size and low density, lack of construction materials, and a relatively narrow range of artefacts, mostly decorated sherds or handles of large drinking cups (*kantharoi*). These low-density concentrations appear during the Early Iron Age, and are likely the remains of special, short-term, or seasonal activities, rather than year-round, permanent settlements. As a result, they were designated special-purpose sites (8021, 8022, 8023, 7019, 7020). One of them, Dodoparon (8024), has been discussed above as a site for non-agricultural purposes, such as foraging, hunting, refuge, or ritual activity (see Chapter 19). Two other concentrations were found near burial mounds (8021, 8023) and likely represent feasting or other mortuary activities. Yet another concentration (8022) included a small collection of communal drinking vessels and cups (*kantharoi*), implying feasting or ritual activity.

Burial mounds themselves constitute the final site type. Burial mounds in the Elhovo and Dodoparon study areas date from the Early Bronze Age to the Roman period, and they are most frequent in the Late Bronze Age to Late Iron Age. Once they appear, mounds occupy a special place in the landscape. They are separated from the habitations, lying mostly on the upper slopes and crest of the Elhovo ridge (the Dodoparon area contained only two mounds, so patterns are difficult to recognise). Their abundance marks them as products of patterned behaviour, while their physical segregation indicates their differentiated character. Damage from looting revealed the construction of two Early Iron Age burial mounds in the Elhovo study area. These mounds (6005, 6006) contained enclosures (cists) built of fieldstones that had once held cremated remains and burial gifts. When investigated during survey, the graves were empty; only a few fragments of cannelured pottery were recovered from the debris.

The variation in site function visible in the Late Bronze Age to Late Iron Age surface remains shows that local communities utilised their environs for subsistence as well as a range of social and ritual activities.

16.3.4 Spatial patterns and site hierarchies

Late Bronze Age to Late Iron Age sites continue to be regularly spaced through both the Elhovo and Dodoparon areas, at intervals that vary from one period to the next, within a 1–4 km range. The process of infilling continues. During the Late Bronze Age, one new site appears midway between 8011 and 6027 on the Dereorman River. During the Early Iron Age, another new site appears midway between 8011 and 6018, and a host of sites colonise the Gerenska River. Five new sites appear on a 6 km stretch of riverbank, upstream and down from the single known Late Bronze Age site (6026). An additional two sites sit a little higher up the slope, farther from the river. Larger settlements lie at 3–4 km intervals (7008, 6021, 8012), with smaller, special-purpose sites in between (8021, 7020, 8023), producing an overall spacing of 1–2 km. During the Late Iron Age, the special-purpose sites on both Dereorman and Gerenska Rivers go out of use, while settlements grow. New daughter sites appear in the northwest part of the study area closer to the Tundzha River. These changes and lower site numbers return the average site spacing to 3–4 km during the Late Iron Age. The smaller Dodoparon study area only contains one to three sites, too small a sample for analysis, but excepting the ambiguous case of Dodoparon itself in the Early Iron Age, they conform to the pattern of placement along streams (the Malazmak and Mordere in this case).

Sites (whether settlements or special-purpose) remain equidistant from one another during the Late Bronze Age and Early Iron Age, even as the distances between them change. As site numbers increase, the spacings between them decrease, conforming to a linear pattern of colonisation, in which a daughter site is established between two existing sites (see Fig. 16.2). This process continues along the Gerenska and Dereorman Rivers until there is a large site every 3–4 km, with one or two smaller sites in between, producing 1–2 km site intervals. In the Late Iron Age, some of the smaller sites are abandoned, as discussed above.

The site count during the Early Iron Age represents a new high for the Yambol study areas (15 sites or 0.5 per sq km). Site abundance and dispersal parallels the Kazanlak Valley (see Chapter 10), where the Early Iron Age dataset shows the same trend of site proliferation and increased utilisation of the available environmental zones. Likewise, archaeological surveys conducted by Özdögan at the confluence of the Tundzha and Maritsa Rivers in European Turkey (ca. 60 km to the south of Yambol study areas) have revealed a similar abundance of Early Iron

Age sites along tributary streams (Özdögan 1979, 530–4). Özdögan also identified a regional centre, which remains elusive in our Yambol studies areas during the Early Iron Age. As discussed above, site count, but not aggregate area, then falls during the Late Iron Age.

Residential and mortuary landscapes are distinct: settlements and special-purpose sites occupy the riverbanks and lower slopes, while the dead are buried higher up the slopes or on the ridgelines above. The preference for a south-facing slope prevails during the Late Bronze Age, while the majority of Early Iron Age and Late Iron Age sites have a north-facing aspect. Settlements are the most frequent during both periods; special-purpose sites are a minority.

Most Late Bronze Age and Early Iron Age sites sit near the edges of the study area. This pattern results from the selection of a study area centred on a ridge bounded by two streams (Elhovo), or an upland area stretching down to a stream (Dodoparon). The study areas thus capture only one bank of associated rivers. Due to edge effects, when these study areas are assessed through geostatistical methods (Nearest Neighbour or Ripley's K analysis), they yield a uniform to dispersed pattern (see Table 16.5). A study area centred on the rivers might yield a clustered pattern if more sites were present on the unstudied bank (Hodder and Orton 1976, fig. 3.6).

The Late Bronze Age site size ranks in Table 16.2 show a three-tier hierarchy. Three sites are < 2 ha, one is 2–5 ha, and one is > 5 ha. For the first time in the 3,000-year settlement history of our study areas, sites larger than 2 ha appear, but the total number of sites remains low and we see fewer smaller sites than might be expected. By contrast, the 'EIA' column of Table 16.2 shows that during the Early Iron Age, the number of 'tiny', 'small', and 'medium' sites all increase, leading to a typical distribution with more smaller sites than larger (see also Fig. 16.3). Smaller hamlets and farmsteads (< 2 ha) are now interspersed between larger villages, and small (especially < 0.5 ha) special-purpose areas appear. Sites disperse through the region to produce a diverse landscape of activity and settlement. The Late Iron Age witnesses a decline in site count ('LIA' column, Table 16.2). The 'tiny' and 'small' ranks lose a combined five sites, and two 'medium' sites disappear, while one new 'large' site emerges. This rebalancing across tiers indicates nucleation rather than an overall increase in population, since aggregate site area grows little (Table 16.1). Small settlements and especially special-purpose sites disappear. Nucleating populations flow into sites near the modern villages of Stroyno, Slamino, and Miladinovtsi.

No site can yet be designated a local or a regional centre. Several concentrations are large enough to compete for this status (6036, 8011, 6034), but their multi-component nature may inflate their size. Site 6034 produced the most evidence for imported goods, implying some importance. Trial excavations are required to investigate site character and function further, and perhaps discover a pre-Roman local or regional centre if one existed within these study areas, and surface survey needs to be extended.

While differences between sites were relatively clear (*e.g.*, site size and artefact diversity), little evidence of intrasite differentiation was found. We could detect no pattern within sites governing the distribution of building materials like mud-brick or daub, rare artefacts made of metal or lithic, imported products (or copies), or pottery of various functional types.

16.4 Roman to Late Antique periods

16.4.1 Change and continuity

TRAP teams documented 16 Roman sites in Yambol study areas, 11 in the Elhovo study area and five in the Dodoparon study area (see digital map).[10] The Dodoparon study area site count reaches a long-term maximum, as three new sites joined two pre-existing sites. Overall, seven of 16 Roman sites had no Late Iron Age antecedent (6027, 7023, and 8020 in the Elhovo study area; 6036, 7025, 7026, and 8024 in the Dodoparon study area), although some of them had been occupied in earlier periods. Nine sites continued from the Late Iron Age (6018, 6021, 7019, 7020, 8005, 8011, 8012, and 8026 in Elhovo; 6034 in Dodoparon). Only two Late Iron Age sites produced no the Roman material (6038 in Elhovo; 6037 in Dodoparon), indicating over 80% continuity or reuse. Several Late Iron Age sites grow in size, and a small town appears in the Elhovo study area (Stroyno, site 6018, see Chapter 18). Together the sites covered 59 ha, more than doubling the aggregate area of the Iron Age. Average site size grows to 3.7 ha (Table 16.1). Site count and aggregate area represent all-time highs for the Yambol study areas, and average site size is second only to the Ottoman period. Note, however, that Dewar's estimate of contemporary sites is only one higher in the Roman period (eight) versus the Late Iron Age (seven), indicating more gradual growth than implied by the raw count and area numbers (Fig. 16.1a).

The abundance of Roman (and later) remains relative to earlier periods may, in part, result from archaeological biases. Prehistoric surface material can be hard to identify due to burial, surface wear, low obtrusiveness, or lack of distinctiveness. Locally produced Late Iron Age pottery, for example, is not readily distinguishable from similar Roman-period wares (Hoddinott 1981, 160). If no readily identifiable and datable diagnostic artefacts are recovered from a concentration, the predecessor of a Roman site may go undiscovered. Roman pottery, conversely, is well known, durable, easily spotted (it is often red rather than brown or grey), frequently diagnostic, and was produced in large quantities. Roman sites are hard to miss. Furthermore, the use of roof tile makes even small Roman habitations more visible and datable from surface remains than earlier villages built from less durable materials.

Roman sites may, therefore, be recovered at a higher rate than earlier (or even some later) sites (cf. Fig. 16.1a).

Nine concentrations produced materials dating to Late Antiquity, six in the Elhovo study area and three in the Dodoparon study area (see digital map).[11] Only two produced more than 10 diagnostic artefacts (6034, 8024). In two other instances, the Late Antique date is uncertain (6021, 7023). The remainder yielded small but convincing amounts of combed ware or other distinctly Late Antique materials. Eight sites had Roman predecessors (6018, 6021, 7020, 8005, 8011 in the Elhovo study area; 6034, 7025, and 8024 in the Dodoparon study area). One site in Elhovo was new (7008). Eight Roman sites were abandoned, six in Elhovo (6027, 7019, 7023, 8012, 8020, 8026) and two in Dodoparon (6036, 7026). In short, half the Roman sites continued, and half went out of use. Dewar's model produces a lower estimate of contemporary sites in Late Antiquity compared to the Roman period, but the ratio between raw and corrected site counts in the two periods is similar: eight estimated contemporary Roman sites became four Late Antique sites (Fig. 16.1a). Late Antique sites ranged in size from 0.4 to 4 ha. The average area of Late Antique sites, compared to Roman, dropped from 3.7 to 2.5 ha (Table 16.1). The size of surviving large (6018 and 8011) and small (*e.g.*, the villa at 6021) sites decreased. No sites in the upper two tiers (> 5 ha) remained, and there were four fewer sites in the smaller three tiers (< 5 ha), although the average size of survivors did not decrease (Tables 16.2, 16.4). As a result, aggregate site area decreased from 59 to 22.4 ha (Table 16.3). Declining average and aggregate site size indicate a smaller population, caused either by absolute depopulation or by resettlement to other locales. Considering the historical turmoil associated with the Late Antique transition, population decline and movement to defensible locations may help to explain changes to the settlement pattern.

Little material dating from the seventh to ninth century AD was identified in the Yambol survey areas. Elsewhere in the Mediterranean, seventh to ninth century materials are scarce as well, suggesting that human activities at this time left few archaeologically visible remains (Fentress 2000). Political upheavals in the Byzantine Empire, alongside Avar, Slav, and other movements of people, disrupted existing networks of settlement and exchange. Our study areas also suffer from proximity to the 'Great Fence of Thrace' or Erkesia (Runciman 1930, Appendix 6; Jireček 1888, 502–504). The Great Fence was a defensive structure (a wall with a ditch) built by the Bulgarian kings to defend the Thracian Plain against Byzantine incursion. It was manned and guarded, monitoring exchange between the two polities. The environs of this wall were wasteland, as nobody wanted to settle in this no man's land (Jireček 1888, 505). Jireček observed the remains of the Erkesia on the eastern slopes of Bakadzhitsite to the southeast of Yambol, with additional remains to the northwest of Manastirski Vazvishenniya. A section of the Erkesia has been excavated at the village of Liulin north of the Elhovo study area (see Soustal 1991 and Chapter 12 this volume).

16.4.2 Topography and soils

Roman and Late Antique sites show the same soil and location preferences that we have seen during the previous three millennia. In Late Antiquity especially, defensible positions are also sought out, represented by the fortress of Dodoparon. Sites are evenly distributed on south- and north-facing slopes, at ca. 4 km intervals, making use of the fertile soils on river slopes and terraces (see Fig. 16.1b). Even new foundations, such as 7008, are a variation on the same theme: a settlement on a north-facing slope of the Elhovo ridge. The elevated fortress at Dodoparon (8024) had mineral and likely forest resources nearby. Excavations there show that Dodoparon appears to have relied on trade for food, offering metals in exchange. Farms, such as site 7025 below the hill, may have supplied the site, while slag recovered from Dodoparon attests to metal production there (see Chapter 19).

16.4.3 Site types

Roman period sites fall into the same functional categories as those of the Early Iron Age and Late Iron Age: habitations, special-purpose sites, and burials. We now see a greater variety of habitations. For the first time a settlement large enough to be considered a town appears (Stroyno, site 6018), alongside several villages and villas (*e.g.*, 7025, 6021). Small concentrations of Roman material covering 1–2 ha were common (eight out of 16 concentrations recorded during surface survey). These concentrations included high-quality tableware, storage and transport amphorae, food processing and farming implements, architectural ceramics, and occasional pieces of glass or metal. We interpreted these sites as small farmsteads or villas (*villa rustica*). Later in the Roman period, the first fortified (but probably multi-purpose) site comes into use (Dodoparon). Habitations were identified based on surface assemblages, combined with legacy data and information from new excavations where possible (see Chapters 18, 19, and 20).

Overall, Roman sites exhibit more variation within individual assemblages, indicating a range of activities including farming, craft production, and trade. Early and Late Iron Age concentrations showed little intrasite differentiation, implying only small social differences among residents. In Roman assemblages, by contrast, the variation in rank and wealth seem more pronounced, perhaps because elites had better access to a wider range of goods than previously. Inscriptions on stone and metal show a new level of self-awareness among the communities in the region (see Chapter 21).

Stroyno (6018) has been classified as a local administrative centre based on its numerous and varied surface remains. Architecture materials were strewn

about in such quantity that it hampered agricultural use of the field. Limestone capitals and column drums lay on the ground near piles of tile and building stones, all overgrown by dense vegetation. Test excavations at this site revealed third-century AD houses and pottery (see Chapter 18). The discovery of bronze military diplomas led to the interpretation of the site as a colony of Roman veterans (Bakardzhiev 2007). Several mounds in the vicinity produced lavish Roman burials, which included military accoutrements (Agre 2009). These burials can probably be associated with the town's inhabitants. It has been proposed that a major Roman road between Edirne and Deultum ran nearby, also serving as a dividing line between the three military districts of Roman Thrace: Stara Zagora (Beroe), Edirne (Adrianople), and Burgas (Deultum and Aquae Calidae) on the Black Sea coast (Šopova 2004, map on page 312). Settlements tend to align along transportation routes, and the existence of a road here could have stimulated local settlement. Auxiliary troops or veterans guarded roads in Roman Thrace. Veterans were settled in *vici* or *praesidia*, like Stroyno. The protection guaranteed by these soldiers may have further encouraged settlement of the local countryside (Nikolov 1994, 131). Materials recovered from some of the smaller settlements around Stroyno included elite objects such as high-quality Roman Red Slip pottery, glass fragments, and plumbing pipes (7019, 6021, 8005). These sites may represent the private dwellings of administrative officials, high-ranking military officers, or merchants associated with the town of Stroyno.

Most Late Antique sites were interpreted as residential areas, including farmsteads (7025, 6021) and villages (7008, 6018, 8011). Exceptions included 8005, which may have been a special-purpose site, and Dodoparon (8024), which was primarily defensive but also served as a habitation and craft production site.

16.4.4 Spatial patterns and site hierarchies

The distribution of Roman sites shows spatial pattern similar to previous periods, with sites following the watercourses. Spacings between sites remained regular, with 2–3 km intervals between large settlements. As habitation expanded, daughter settlements or special-purpose sites emerged at 1–2 km intervals (*e.g.*, 8005, 7023, 6027, and possibly 7019). In Dodoparon, five sites formed a line, with variable 1–4 km spacings between them, leading from the Malazmak stream towards Dodoparon. North facing slopes were popular among small settlements, while large sites concentrated on the south slopes (8011, 6018). The largest sites can be found in the Elhovo study area along the Dereorman, led by Stroyno. Two factors contributed to the growth of settlements along the northern bank of Dereorman River: the presence of Roman veterans at Stroyno, extending Roman administration into the area, and the existence of a Roman road, believed to have led along the Dereorman River towards the Bay of Burgas (see 'Regional connections' in Chapter 18). Security and commerce thus provided powerful stimuli for local settlement.

The three- to four-tier site size hierarchy, established during the Late Bronze Age and continuing in subsequent periods, becomes more top-heavy during the Roman period (see the histograms in Fig. 16.3). For the first time, a site over 10 ha appears. The top three tiers (> 2 ha) increased by three sites, accounting for 50% of the sites and 86% of the inhabited area (Tables 16.2–16.3). The growth in the top tiers indicates population increase and nucleation, consistent with incipient urbanisation. At the same time, the bottom two tiers (< 2 ha) grow more slowly, adding two sites. They account for 50% of the sites but only 14% of the inhabited area (Tables 16.2–16.3). These figures represent a relative, not an absolute, decrease in the count and aggregate area of smaller sites, revealing a flourishing rural hinterland.

The Elhovo study area became densely settled in the Roman period. Because of the effect of the central place at Stroyno and the likely presence of a major road, it is not clear that it can be considered representative of the Yambol region as a whole. Although site numbers and overall population trended upwards in Yambol during the Roman period, that tendency is not ubiquitous; much of the region was remote and quite 'empty' (Dimitrova and Popov 1978). Dense settlement is attested elsewhere, however, as in the environs of Kabyle, which lies some 40 km north of the Elhovo study area. The Macedonians founded Kabyle in the fourth century BC, and it remained a garrison city throughout the Roman period and into Late Antiquity, controlling traffic between the Thracian Plain and the Black and Aegean Seas. As was the case with Stroyno, the elites living in Kabyle could have inhabited the numerous villas in the vicinity.

Late Antiquity saw drop in site count and aggregate area across all tiers (Tables 16.3–16.4). Seven sites went out of use, five in the Elhovo study area and two in the Dodoparon area. The total inhabited area declined by well over half (59 to 22.4 ha; see Table 16.1), indicating a decrease in population. Site spacings in Dodoparon increased to 4–5 km and became more regular, as two pairs of nearby sites consolidated into one site per locale. In Elhovo, sites in the western and (especially) eastern ends of the study area were abandoned. Remaining sites were spaced at 2–3 km intervals in the middle stretches of the two streams that bounded the study area. The consolidation of neighbouring sites in Dodoparon contrasts with the abandonment of outlying sites in Elhovo, representing two responses to the changing conditions.

The largest Late Antique sites fall into the 'medium' tier (2–5 ha). Amongst the remaining sites, the distribution remains somewhat top-heavy. Four 2–5 ha sites survive, together covering 16 ha, alongside five sites smaller than 2 ha, covering 6.4 ha. The 'medium' tier thus accounts for 44% of the sites and 71% of the inhabited area, while the

'tiny' and 'small' tiers together account for 66% of sites and 29% of inhabited area. Five sites in the Elhovo area were abandoned. Stroyno and other surviving Elhovo sites shrank. The fortified site of Dodoparon (8024) persisted, but two sites in its hinterland disappeared, while one of the remaining sites shrank. In both areas, Roman-period sites below 0.5 ha were abandoned, and sites over 5 ha disappeared entirely. Settlement decline aligns with historical evidence of turmoil (*e.g.*, Cameron 1993; 2006). It appears that living in isolated farmsteads was no longer as safe, and the economic and administrative situation could no longer support large centres. Communities aggregated in mid-sized settlements, which appear to have been the most viable during the military and political upheavals of Late Antiquity. As discussed above, little evidence of subsequent Early Byzantine settlement was recovered.

16.5 Mediaeval to Ottoman periods

16.5.1 Change and continuity

TRAP documented *sgrafitto* ware and other glazed ceramics dating to Mediaeval period at eight surface concentrations, six in the Elhovo study are and two in the Dodoparon study area (see digital map; Borisov 2002, 194–201).[12] Medieval concentrations ranged in size from 0.3 to 13.2 ha, and averaged 3.1 ha per site (Tables 16.1–16.2, 16.4). Aggregate site area (24.6 ha) is similar to Late Antiquity (or the Iron Age). Concentration 7008 is the largest at 13.2 ha, over twice the area of any Late Antique site. One site in Elhovo (8023) and one in Dodoparon (7024) arose in new places. All other sites reappeared in areas previously occupied during the Roman period or Late Antiquity. In Elhovo, three sites overlap with areas of Late Antique activity (6018, 7008, 8011), and two appeared in areas utilised during the Roman period (6027, 8012). In Dodoparon, one concentration overlaps a Late Antique site (6034), and another a Roman site (7025). Even though some Mediaeval site location choices were similar to earlier periods, the settlement hiatus during the Early Byzantine period and First Bulgarian Kingdom means that all Mediaeval sites should probably be considered new foundations.

Material dating to the Ottoman period was also recorded at eight surface concentrations, five in Elhovo and three in Dodoparon (see digital map).[13] Two sites were new in Elhovo (7009 and 7020) and one was new in the Dodoparon study area (6037). Sites 8011, 8012, and 8023 in the Elhovo study area disappear. While most of these concentrations were small and low-density, the continued growth of 7008 to 33.4 ha inflated the average site area to 5.3 ha and the aggregate area to 42.6 ha (Tables 16.1, 16.4). Five Ottoman distributions were located at sites with Mediaeval components (6018, 6027, and 7008 in Elhovo; 6034 and 7024 in Dodoparon). At two other locations, Ottoman materials appeared together with Late Antique or earlier remains (6037 in Dodoparon and 7020 in Elhovo). Only in one case (7009) were Ottoman artefacts found in an entirely new location.

16.5.2 Topography and soils

Settlement location preferences remained consistent with previous periods. River terraces and lower hillsides were favoured, while ridgelines and upper hillsides were avoided. Elevated locations like Dodoparon were abandoned after Late Antiquity and not reoccupied. All sites lay within similar environmental settings, near water and surrounded by *smolnitsa* soils (Fig. 16.1b). Continuity with earlier periods may indicate similar economic activities in the context of renewed social and political stability.

16.5.3 Site types

Mediaeval sites can be divided into three categories, < 2 ha, 2–5 ha, and > 10 ha. Site 7008 was an 'extra-large' top-tier site (13 ha) lying in the Elhovo study area, with evidence of permanent structures, farming, and craft production (metal and glass fragments or wasters). Two fragments of turquoise glazed bowls, possibly of Iranian origin, point to long-distance trade (*e.g.*, Inv. nos. 60097.4 and 60098.4 in the Artefact catalogue).[14] This site should probably be considered a large village or small town, and at least a local centre. No 'large' concentrations (5–10 ha) were found. A single 'medium' site (8012) fell into the 2–5 ha tier, also in Elhovo and about 6 km east of 7008. This village produced architectural ceramics and a variety of domestic materials, including a large quantity of storage and transport amphorae. The remaining concentrations likely represent hamlets and farmsteads, or perhaps agricultural outbuildings or activity areas, < 2 ha in size (6018, 6027, 6034, 7024, 8011, 8023). While the larger sites contained a greater variety of materials, these smaller sites usually featured a narrower range, consisting mostly of architectural ceramics and a few shards of storage, transport, or tableware vessels. Consequently, we interpreted these small concentrations as individual residences or non-residential structures. The latter may include agricultural sheds or huts (6018, 7024, 8011) or the remains of manuring or dumping (6034, 8012, 8023).

The Ottoman site size classification follows Mediaeval patterns. The top-tier site at 7008 grows further, to 33 ha (Table 16.3). Low piles of fieldstones mark collapsed house foundations, which are surrounded by scatters of glazed table and storage wares, grindstones, and fragments of metal and glass. The Medieval, medium-sized site 8012 is amongst those abandoned, leaving 7008 an order of magnitude larger than any other site in Elhovo. All other concentrations are much smaller and less diversified. They are, perhaps, non-residential in character, since they either lack architectural ceramics or display a narrow and highly worn range of artefacts. As such, we have interpreted them as remains of manuring or dumping (*e.g.*, 6018, 6027), or short-term agricultural installations (*e.g.*,

7009). The three sites in the Dodoparon area fall into the 'small' and 'medium' tiers (0.5–5 ha), and may likewise represent temporary structures like huts or sheds (7024), or agricultural field activities (6034, 6037).

16.5.4 Spatial patterns and site hierarchies

Mediaeval and Ottoman habitations, whether large or small, show a preference for north-facing slopes in both study areas. The southern slopes are still used, but seem reserved for non-residential, ephemeral activities (*e.g.*, 8011, 6018, 6027). The parent settlements for these ephemeral activity areas may lie outside the study areas, closer to the modern villages on the opposite banks of the streams.

Mediaeval and Ottoman concentrations in Elhovo, and possibly Dodoparon, remain evenly spaced. Sites in the Elhovo area, regardless of function, lie 2–4 km apart. In Dodoparon, sites are only 1–3 km from one another, but the proximity of sites 6034 and 6037 during the Ottoman period may indicate that they are really a single concentration, separated by later field division (likewise, possibly, Medieval sites 8012 and 8023 in Elhovo). Settlement patterns suggest that the Elhovo study area is taking on its modern role as an agricultural hinterland with towns or villages around its perimeter. The growth of 7008 in the northwest part of the Elhovo study area may have been stimulated by its safe distance from the Tundzha River, and the foundation of the Dermen-Kalesi fort (excavated in the 1960s, just west of the study area). The fort guarded the main north–south route along the Tundzha River between Yambol and Adrianople, which Jireček noted during his 1884 expedition. The location of 7008 on a platform above a tributary stream is also consistent with Jireček's observations about preferred settlement locations (1888, 499–507).

The histogram of site sizes (Fig. 16.3) is sparse and shows a considerable gap between the small-to-medium-sized sites (< 5 ha) and the single site (7008) in the largest tier (> 10 ha) during the Mediaeval period. 'Large' sites (5–10 ha) sites are missing, and only one 'medium' site (2–5 ha) was found (8012). The paucity of 2–10 ha sties may result from a small sample size; we would expect to find more sites of this size in a typical settlement size distribution. The 'missing' sites may lie outside the TRAP study areas. Acknowledging the small size of the dataset and the impact of edge effects, the histogram and the table of average site areas indicates perhaps a three-tier hierarchy of sites, with ranks at < 2 ha, at 5 ha, and 15 ha (Fig. 16.3 and Table 16.4).

In the Ottoman period, the site size histogram (Fig. 16.3, with the ca. 33 ha site 7008 off the chart) indicates the gap between the single largest settlement and all others has increased further. 'Large' 5–10 ha sites are still missing, and the single 'medium' 2–5 ha site (6034) may not even be a settlement. Sites in the two smallest ranks sometimes change location, but are otherwise relatively stable in count, aggregate area, and average area (Tables 16.2–16.4) The Ottoman sample of sites, like its Mediaeval predecessor, lacks mid-tier sites, again reflecting the small size of the dataset and study area edge effects.

16.6 Discussion

In the Yambol study areas, rivers form the focal lines for local settlement: the Malazmak in the Dodoparon study area and the Gerenska and Dereorman in the Elhovo study area. The survey results offer us, by nature of study area selection, only one riverbank of each watercourse. This limitation prevents the exploration of activities on the opposing bank, and hinders the study of settlement dynamics in a linear, riverine system. As such, this chapter has presented a diachronic overview of habitation size and distribution, aiming to characterise the environmental or social factors that determined site spacings.

The topography and environment of each study area represent the wider region: the Elhovo ridge is one of many east–west ridges lying east of the Tundzha River. The lowlands sloping down from Dodoparon, with their network of streams, are representative of similar lowlands below the Sakar and Rhodope Mountains. Each landscape offers fertile river terraces and slopes above, with *smolnitsa* and forest soils. They also offer access to woodland, pasture, and stone and mineral resources, with few resource bottlenecks. These landscapes are mostly open and accessible (especially if woodlands are thinned); the most imposing topographical features in the Thracian Plain are low ridgelines or isolated hills.

Data from the Elhovo study area allow us to evaluate the relative weight of social and environmental influences on site location, especially spacing between sites. Were site intervals driven primarily by agricultural potential, they would reflect a combination of soil productivity and the width of arable land at any given point along a river. Sites would be closer together where desirable soils extend some distance from the river, and further apart where soil is poorer and/or the strip of arable land narrower. If social pressures are paramount, conversely, uniform spacing would be seen regardless of the quality and quantity of arable land available (Flannery 1976, 177).

Acknowledging (1) the problems with site contemporaneity discussed in Chapter 15, (2) the fact that a sample of six to 15 sites is too small for rigorous statistics, and (3) the availability of information from only one bank of each river, site spacings appear to remain equal over time, although the specific interval varies across chronological periods. When site numbers are high, as during the Early Iron Age, site spacings drop to ca. 2 km. If the smaller settlements and non-residential sites are excluded, the remaining, larger settlements lie about 3–4 km apart. If we perform the same exercise for all periods, the interval between substantial settlements usually hovers

around 3–5 km. If settlements divided the land equally, each would have access to an agricultural catchment stretching 1.5–2.5 km upstream and downstream, and as wide as the arable land at that point along the river. Flannery's study from the Atoyac River in Belize, furthermore, reminds us that regularly spaced sites can hide 'great disparities in hectares of land available per village' (1976, 177). Despite these disparities, he concludes that all villages had access to more land than they required for sustenance, even if half the farmland is kept fallow (Flannery 1976, 178). The same patterns – equal site spacings providing access to adequate but disparate amounts of arable land – probably hold true in our study areas. In the Roman period, for example, large sites likely drew resources from a larger catchment than signalled by the distance to their nearest neighbours. Whether the spacings are large or small in any given period, they remain the same, regardless of the size of their arable catchments.

If we compare our two river valleys rather than use area-wide averages, we see further evidence supporting the primacy of social factors in site spacing. The Elhovo study area provides a natural experiment allowing us to compare 'wide' and 'narrow' arable zones: the valley of the Gerenska is wide and gently sloped, while the banks of Dereorman are steeper, with the Bakadzhik Ridge enclosing the river to the south. Although the density of sites along each river varies over time, no clear relationship between site spacing and available arable land emerges. The Dereorman has more sites than the Gerenska in the Early Bronze Age, Late Bronze Age, and Ottoman period (although during the Ottoman period the Dereorman sites are considerably smaller than the Gerenska sites). It has fewer (but larger) sites from the Early Iron Age through Late Antiquity. The two rivers host the same number of sites during the Neolithic, Chalcolithic, and Mediaeval period (with the Dereorman having larger sites in the prehistoric period and smaller in the Mediaeval). We do not consistently see more sites along the wider Gerenska valley, and sometimes do see more along the narrower Dereorman valley, indicating that environmental factors related to agriculture do not seem to govern settlement spacing.

Following Burghardt (1959), if local agricultural factors are about equal, as they are along each of our rivers, sites may be positioned to exploit hinterlands that are more distant. In the Elhovo study area, that hinterland includes the ridgeline above the rivers, which provided pasture, woodland, and stone. The upper slopes and the ridgeline also served as significant mortuary areas, marked by burial mounds built over two millennia. In the Dodoparon study area, the hinterland consists of Gradishteto, the hill that the site of Dodoparon itself sits upon, which provided upland forest for wood, hunting, and foraging, stone and mineral resources, and a defensible refuge in times of need. The relative value of the hinterlands explored by the TRAP project awaits additional investigations beyond our study areas, especially across the rivers. Until then, access to varied hinterlands providing diverse resources appears to have been relatively equal across the Elhovo study areas.

Settlements remain equidistant over time, despite differences in the amount of arable land or hinterland resources available. Site density is, furthermore, sometimes greater in the narrower (and presumably less favourable) valley of the Dereorman than in the wider Gerenska valley. Hinterland resources appear widely distributed, providing relatively equal access throughout the Elhovo study areas. Site spacing over time does not appear to depend upon the availability of farmland along the river or access to pasturage, wood, and other resources in more distant hinterlands. Instead, the degree of competition or cooperation between sites seems to be the principal driver of site spacing. Total population, of course, was bounded by the overall carrying capacity of the land, which may have been enhanced in times of political stability and active commerce. Indeed, the otherwise odd preference for the narrower Dereorman valley in the Late Iron Age, Roman period, and Late Antiquity may have resulted from the existence of a road from the Tundzha River to the Black Sea. In short, our survey data appears to indicate that social rather than environmental factors drove settlement spacing in the Elhovo study area, and likely the Dodoparon study area as well.

16.7 Conclusion

The first sedentary communities that appear in the Yambol study areas emerge near rivers, at substantial distances from each other (intervals of ca. 5 km). They were held apart by some combination of environmental factors (like the availability of local arable land and hinterland resources), and social factors (like the nature of inter-site relationships). Most 'flat' Neolithic sites (6026, 6036, 6018) sit right on the banks of the Gerenska, Dereorman, and Malazmak tributaries, while the single Neolithic tell (8019) lies on the Tundzha River itself, suggesting that its existence was tied to its floodplain and perhaps a crossing of this major river. The tell and the three other riverbank sites are abandoned after the Neolithic. Chalcolithic sites are situated farther from the rivers at more elevated locations, but most still lie within 1 km of the rivers on fertile terraces or lower slopes (6034, 8011, 8021). The new long-term site at Konevetz tell (8025), situated about 2 km from the Gerenska on some of the highest ground available within the Elhovo study area, represents the most extreme example of the new preference for sites farther from the rivers. Environmental data suggest that increasing humidity may have rendered locations right on the rivers, especially the Tundzha, less suitable for settlement (Chapter 13). Overall site numbers and aggregate area remain about the same from the Neolithic through the Early Bronze Age.

When evaluating settlement patterns in the earliest periods, artefact survival and visibility must be taken

into account. In the Kazanlak Valley, Neolithic and Chalcolithic sites were scarce (one site per 25 sq km, including two legacy tells). There, sites were hidden by burial from soil deposition (as became clear during test excavations), and were easiest to detect in erosion zones. In the Yambol study areas, Neolithic and Chalcolithic sites are also scarce compared to later periods but more frequent than in Kazanlak (one site per 7–8 sq km, again including two legacy tells). Unlike in Kazanlak, most of the Yambol terrain is sloping, and thus more prone to erosion, and there are fewer large depositional zones like those at the foot of the Stara Planina. Without trial excavations, however, we cannot determine the degree to which early sites suffer from burial. Likewise, no erosion study like that conducted for Kazanlak (Chapter 7) has yet been undertaken for Yambol. It appears, however, that there is less bias against early sites in Yambol than in Kazanlak.

With the onset of the Late Bronze Age, Yambol communities relocate back to the riverbanks. Intervals between them shrink to 3 km. During the Early Iron Age, sites triple in number and disperse across topographic zones, from the riverbanks, to the slopes above them, and even (arguably) to the peak of Dodoparon. As communities grow, they fission and colonise new areas, filling in gaps between existing settlements just as one would anticipate from the model of settlement evolution along a linear system (Fig. 16.2). Equal spacings are maintained between sites, but in the Early Iron Age they shrink to 2 km among all sites (but remain 3–4 km if only sites > 2 ha are considered). The distribution of sites and the utilisation of available environmental zones is consistent with the Kazanlak Valley, which shows similar trends during the Early Iron Age. Both areas witness settlement growth and evidence of activity across the landscape between permanent habitations, signified by a proliferation of 'special-purpose', non-residential sites. The drivers of these trends in Yambol are likely social, possibly related to the inter-site relationships or access to the mortuary landscape occupying the upper slopes of the ridgeline between the rivers. The processes behind similar Early Iron Age settlement dynamics in Yambol and Kazanlak warrant further investigation.

During the Late Iron Age, site numbers drop, but settlements grow in size (*e.g.*, 8011 and 6034 are > 5 ha). Intervals between large sites remain 3–4 km, the distance between modern villages in the area. Given the relatively large spacing (compared to preceding and succeeding periods), the long-term viability, and the productivity of available farmland, all sites probably had access to sufficient agricultural production for their subsistence. The presence of imported transport vessels and imitation black slip at sites 6034, 6036, 7019, and 8011 hint at the interactions between local communities and trading hubs of the Northern Aegean and Black Sea (see Chapter 20).

The Roman period is the time of fluorescence for both study areas. Settlements grow, and top-tier sites (> 10 ha; *e.g.*, 6018, 8024, 8011) begin to offer urban infrastructure and facilities, manifested in surviving architecture and architectural ceramics, fortifications, inscriptions, coins, metal objects, and a wide range of both locally-made and imported ceramics. The settlement pattern follows the precedent of sites situated along watercourses, with spacings between substantial sites (> 2 ha) hovering around 2–3 km, although sometimes smaller sites were closer to others. South-facing sites along the Dereorman exhibit the most growth, perhaps due to a Roman road running from the Tundzha valley eastward to Deultum on the Black Sea. North-facing slopes show a proliferation of mostly smaller, rural sites along the Gerenska, constituting a productive agricultural zone. This fluorescence suggests a period of peace and commerce, which the Roman army veterans settled at Stroyno may have fostered (see Chapter 18). Part of the *Pax Romana*, these veterans may have kept order and underwrote the growth of the town (and perhaps other settlements as well), which contributed to local prosperity and promoted trade and other connections with the outside world.

The post-Roman periods show a decrease in site numbers, aggregate area, and likely population (during Late Antiquity), and then a subsequent hiatus in settlement (during the Early Byzantine period). This decline is probably associated with the political upheavals and economic dislocation associated with the Late Antique transition in the Eastern Roman Empire. The elevated and fortified site of Dodoparon (8024) is occupied in the Late Roman and Late Antique periods (see Chapter 19). Dodoparon is also the only site where Early Byzantine presence is suspected, although further excavation will be required to verify it.

Settlements return to Elhovo and Dodoparon study areas during Mediaeval period. Most old sites are abandoned or show only ephemeral usage, but other sites emerge in new locations (*e.g.*, 7008, 7024). Similar site location preferences, however, seem to apply. New sites sit on terraces above the Gerenska River in the Elhovo study area and a tributary of the Malazmak Stream in the Dodoparon study area. Site spacings are large (3–5 km), and other new foundations may have appeared on the opposite, unexplored riverbanks. The restructuring of settlement is complete by the Ottoman era, when site 7008 reaches the status of a town (perhaps the antecedent to the modern village of Karavelovo), and the rest of the study area becomes a rural hinterland, strewn with outbuildings and the remains of dumping, manuring, and other agricultural activities. A modern map shows most settlements on riverbanks opposite our study areas (the villages of Slamino, Robovo, Boyanovo and Miladinovtsi), often just a kilometre or two from abandoned Ottoman sites, which have reverted to farmland.

The Yambol study area offers an example of an archaeological landscape that evolved linear, riverine patterns along the tributaries of the Tundzha. Although the single dimension, the low settlement count, and edge effects limit geostatistical analysis, a simple analysis of site size and spacing illuminates settlement growth and decline, and variations in site location preference over time. We can use this analysis to characterise regional trends, at least provisionally. The equidistant (if variable) spacing of settlements across time indicates that social factors like inter-site relationships and access to commerce or mortuary, governed site intervals and locations, rather than environmental factors like the availability of arable land near the settlements or hinterland resources further away.

Notes

1 TRAP Digital Archive DOI: https://doi.org/10.6078/M7TD9VD3
2 Distribution of Neolithic surface remains within the Dodoparon (left) and Elhovo (right) study areas – DOI:https://doi.org/10.6078/M70863CK
3 Distribution of Chalcolithic surface remains within the Dodoparon (left) and Elhovo (right) study areas – DOI:https://doi.org/10.6078/M7VH5KWW
4 Yambol surface concentrations indicating diagnostic material – DOI: https://doi.org/10.6078/M7QN64T4
5 Distribution of Early Bronze Age surface remains within the Dodoparon (left) and Elhovo (right) study areas – DOI: https://doi.org/10.6078/M7QR4V61
6 Distribution of Late Bronze Age surface remains within the Dodoparon (left) and Elhovo (right) study areas – DOI:https://doi.org/10.6078/M7M32SVG
7 Distribution of Early Iron Age surface remains within the Dodoparon (left) and Elhovo (right) study areas – DOI:https://doi.org/10.6078/M7GB2250
8 Same as Endnote 4 above
9 Distribution of Late Iron Age surface remains within the Dodoparon (left) and Elhovo (right) study areas – DOI:https://doi.org/10.6078/M7BK19F8
10 Distribution of Roman period surface remains within the Dodoparon (left) and Elhovo (right) study areas – DOI:https://doi.org/10.6078/M7TH8JSZ
11 Distribution of Late Antique surface remains within the Dodoparon (left) and Elhovo (right) study areas – DOI:https://doi.org/10.6078/M7319SZ4
12 Distribution of Mediaeval surface remains within the Dodoparon (left) and Elhovo (right) study areas – DOI:https://doi.org/10.6078/M7Z899G7
13 Distribution of Ottoman surface remains within the Dodoparon (left) and Elhovo (right) study areas – DOI:https://doi.org/10.6078/M7TH8JSZ
14 TRAP Artefact catalogue – DOI:https://doi.org/10.6078/M7BP00VK

PART IV
Associated Studies

17

Excavation and palaeodietary analysis of Bronze Age human remains from Boyanovo, Yambol province

Karen Privat, Adela Sobotkova, Stefan Bakardzhiev, and Victoria Russeva

Abstract *The three mounds located at the mortuary site of Boyanovo on a limestone outcrop above the Thracian Plain were surveyed by the Tundzha Regional Archaeology Project (TRAP) in 2009. It is located at the convergence of the southeastern Balkans and the Eurasian steppe and border-steppe regions. Across these geographical regions and beyond, the Bronze Age was a period of flux, with a tendency toward increased mobility for portions of communities or entire groups. The increasing economic dependence of humans upon their domestic animals in the Bronze Age and subsequent Iron Age is reflected in the archaeological evidence for a shift toward domesticated animal remains over wild or agricultural resources. The location, chronology, and burial context of the human remains recovered from the mortuary site of Boyanovo link these individuals with contemporary pastoral trends. In this study, stable isotope analysis of collagen extracted from the bones of 14 individuals is applied to investigate dietary patterns within the Boyanovo population. Data from this study are compared to other archaeological communities with palaeodietary habits including diets high in freshwater fish, terrestrial domesticates (plants and animals), and millet. This analysis elucidates a critical aspect of daily life, subsistence, complementing the mortuary information available from the archaeology of the site. The results indicate that humans interred at Boyanovo relied upon terrestrial fauna for their dietary protein. Carbon stable isotope values of the population reflect a mixed C_3-C_4 diet, either from regular, direct consumption of C_4 plants (especially millet) or the frequent consumption of animals grazed or foddered on a high-C_4 diet.*

Keywords *Boyanovo; Bronze Age; burial mounds; isotope analysis; paleodiet; mortuary archaeology*

17.1 Introduction

The results of isotope analysis of human skeletal material from the Boyanovo burial mounds 8007 and 6009 are provided in this chapter. These mounds were registered during the Tundzha Regional Archaeological Project (TRAP) surface survey in 2009 and excavated by the Yambol History Museum in the autumn of 2010. The excavation affected mounds 7004, 8007, and 6009, which were located on a limestone outcrop that was being converted into a quarry (see Fig. 17.1). The impending industrial development necessitated a salvage excavation, which was completed during September 2010 under the direction of Stefan Bakardzhiev and Ilija Iliev of the Yambol History Museum. Mound 8007 contained 20 burials of 23 individuals dated to the Early Bronze Age (3300–2000 BC) and the Late Bronze Age (1600–1100 BC, see digital dataset).[1] Mound 6009 contained four graves with five inhumations. After excavation, skeletal remains were described by Victoria Russeva for age, sex, and pathologies. Russeva took samples from all adult individuals for bone collagen analysis. Karen Privat processed the samples and succeeded in extracting collagen from samples of 14 individuals during 2012 and 2013.

The recovery of human remains at Boyanovo provided the opportunity to conduct a detailed investigation of human diet, revealing information about the subsistence trends of the individuals analysed. The current study builds on earlier palaeodietary research (*e.g.*, Privat 2004; Honch *et al.* 2006; Gerling 2015; Lightfoot *et al.* 2015) that has examined Eneolithic–Iron Age groups from Hungary and the Balkans in the west, through to the Black Sea, Ural regions, and Siberia in the east. It expands the dataset for Bronze Age Bulgaria. The cultural and environmental context of Boyanovo allows the newly obtained information to be meaningfully

compared with the existing data. The nature of major protein is investigated (*i.e.*, faunal), as are dietary resources and the degree to which they were consumed by the Boyanovo population. The Boyanovo palaeodietary data are examined to determine whether millet played an important role in the subsistence economy at Bronze Age Boyanovo, whether by direct consumption or via the consumption of the products of animals fed on millet (*cf.* Liu *et al.* 2012; Svyatko *et al.* 2013).

17.2 Archaeological background

17.2.1 Setting

The Boyanovo funerary complex, comprising mounds 8007, 7004, and 6009, is located 2.7 km west of the Tundzha River and 2 km north of Boyanovo village, in the Yambol province of southeastern Bulgaria (Fig. 17.1). This area is at the southern edge of the Thracian Plain, within an area of forest-steppe bordered by steppe to the northeast, forests, and montane forests to the west, and Pontic coastal environments to the south and east.

There were 17 mounds identified in the Boyanovo municipality during 2009, 12 of which TRAP documented. Several of them had been excavated in 2007 and 2009 by Daniela Agre (2008, 235–8; 2010, 279) with some samples analysed by Gerling (2015). Three were excavated by the Yambol History Museum in 2010.

The three mounds of the Boyanovo complex were amongst 52 registered during the TRAP survey of the Elhovo study area (*cf.* Chapter 11). Mound 8007 sat directly atop a limestone outcrop (ca. 235 masl) that dominated the surveyed ridge. It was the largest of the three mounds, 45 m in diameter and 4.8 m in height (see Fig. 17.2). Its size and visibility were accentuated by its position (the presence of a geodetic marker on top of the mound attested to its prominence). Mound 7004 lay 300 m southeast of 8007. Somewhat smaller, it was 40 m in diameter and 3 m high. Mound 6009 lay another 100 m southeast of 7004. It was the smallest of the three, measuring 23 m in diameter and 1.6 m high. Prior to excavation, all three were overgrown with low scrub and marred by robber's trenches.

17.2.2 Excavation summary

The 2010 salvage excavations of Boyanovo mounds were undertaken over a period of three months, conducted by Stefan Bakardzhiev and Ilija Iliev of the Yambol History

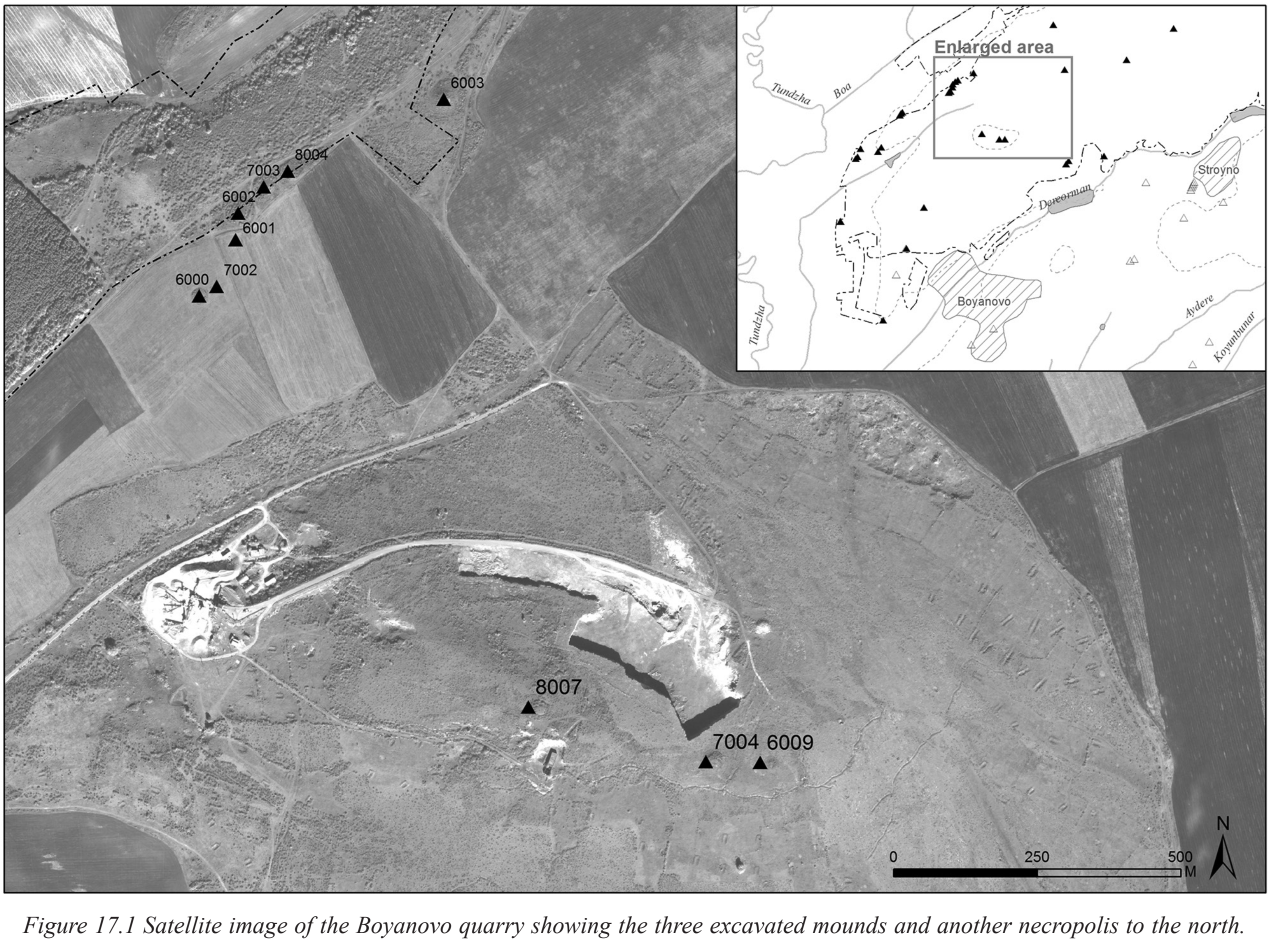


Figure 17.1 Satellite image of the Boyanovo quarry showing the three excavated mounds and another necropolis to the north.

Figure 17.2 Cross-section of mound 8007 looking east. This mound is the source of 14 of the samples used for the present isotope study.

Museum, with Yavor Rusev and Georgi Iliev participating. A Bulgarian report on the salvage work has previously been published (Bakardzhiev *et al.* 2011). A summary of that report, integrating the skeletal analysis provided by Russeva, is provided here to contextualise further analysis.

Excavations confirmed that mound 8007 was constructed and first used for burials in the Early Bronze Age, and was used again during the Late Bronze Age. Later burials from the post-Roman or Mediaeval era were also found. In total, the remains of 20 burials containing 23 individuals were uncovered within the mantle of the mound. Twelve burials were dated to the Early Bronze Age, five to the Late Bronze Age, four to either Early Bronze Age or Late Bronze Age, and two to the post-Roman period. The inventory of burials and their characteristics are reported in the digital dataset.[1] The distribution of burials inside mound 8007 is shown in an associated plan.

The earliest burial in 8007 was at the very base of the mound, where a rectangular chamber had been carved into the bedrock of the outcrop (Fig. 17.3). The walls at the head and foot of the grave were then lined with arranged field stones. Discolouration and debris suggested that the deceased may have been buried in wooden coffins. Three inhumations were found in the original burial chamber (#19, 21, and 22).[2] An adult female of 25–30 years (#21) in a crouched position on her right side was buried first on the floor of the rock-cut grave with the disarticulated skeleton of a child four to five years old (#22) at her feet. Some 30 cm above, separated by fill, another crouched skeleton of 30–40 years (#19; sex indeterminate) lay in the same crouched position. None of the adults had any burial goods, but their skulls were covered in ochre. The fill of the chamber contained a scattering of disarticulated human bones (pelvic bones, teeth, and a humerus, belonging to another individual) and a spindle whorl. The excavators interpreted these as a possible human sacrifice to the dead and collected as #20.

Over the course of the Early Bronze Age, 12 additional individuals were added to the mound and covered by more soil, and so the mound grew. Two graves of similar construction to the original burials (#13 and 17 in stone lined pits with wooden coffins) were found under the east–west profile. Grave #17 had also been dug into the bedrock and contained an adult male, aged 25–30 years; the body had been dismembered after death and buried in a supine position, accompanied by a scatter of finger bones from another, more robust individual. Grave #13 was dug into the existing mound mantle, and contained an adult male, aged 20–25 years, lying in a supine position with bent knees and fallen to the right. Burial goods included a clay jug and a silver pendant dated to the end of the Early Bronze Age. Excavators remarked on the individual's perfect teeth and on the ochre covering his head. Most other deceased from the Early Bronze Age were buried with a similar rite of crouched inhumation in a pit covered with red ochre (#18, 12, 9, and 7; see Fig. 17.3 for example). Some were even without a pit (#2 and 8). Only one burial (#7) had a ceramic jug associated with it, in others the chronological attribution relies on the burial rite rather than on cultural materials.

Five more burials (#4, 5, 6, 10, and 15) were found lying in dark grey-brown soil without any signs of pits with stone linings. All were crouched and two of them (#5 and 15) were accompanied by Late Bronze Age ceramics. The other three burials were of disarticulated skeletons with no grave goods or distinguishing features.

Finally, two supine extended burials (#3 and 14) were later inserted into a finished mound. Given their extended position they could date to the post-Roman period (post-AD 300). However, given the lack of any burial goods, the specific period is difficult to determine.

Turning to the two smaller mounds, 7004 contained no burials or assemblages. Mound 6009 was found to contain four burials with a total of five individuals. Like mound 8007, mound 6009 contained a small stone mound of 3.5×3×0.5 m which sat directly on the ground. This stone mound was covered by a 1 m thick mantle of yellow compacted soil, whose surface was further encircled and lined with unworked stones. Burial #1 was found within the yellow mantle of 6009 at 0.85 m depth; three earlier burials were found in the original stone mound, touching on the sterile ground. Burial #1 was dated to Classical Antiquity based on associated artefacts. Burials #2–4 were dated to the Bronze Age because of two associated handmade ceramic vessels. While mound 6009 had been severely damaged by looters, the burials remained mostly untouched.

All graves in mound 6009 were deliberate inhumations. The oldest and deepest burial in the centre of stone mound (#4) contained a crouched male skeleton of 25–30 years, positioned in a pit cut 0.3 m into the yellow sterile ground. This man had a small ceramic bowl near his

Figure 17.3 The earliest rock-cut chamber in mound 8007 with a typical Early Bronze Age burial: a crouched individual lies on her side inside a wooden coffin or other organic mat placed on the bottom of stone-lined pit; marks of red ochre are traceable on her skull and other remains. There are remains of an infant skeleton at her feet. While the sign says Grave 20, Individual 2, these burials were later re-labelled as burial #21 (female) and #22 (child).

left hand. Burials #3 and 2 followed in slightly higher levels of the original stone mound. In burial #3, a female skeleton of 25–30 years was found together with fragments of a handmade vessel. Long bone remains of burial #2 were found directly above #3 and suggested a crouched individual resting between the rocks without signs of a pit. Many of the cranial and limb bones are documented as dispersed or lost. Remains of skull, ribs, and vertebrae were found embedded at different levels among the surrounding stones. Subsequent osteological analysis confirmed these dispersed components of burial #2 to be the remains of two individuals, a male and female of 60–70 years. The three burials inside the stone pit were interpreted as contemporaneous, having been deposited in sequential stepped pits and covered by the stone mound. Crouched positions and handmade vessels place the burials within the Bronze Age. Burial #1 was found in the yellow mantle above the original stone mound, which confirms its later date. It held an adult male (60–65 years) in supine position. Small brass plates with holes for rivets and a glass bead were found near his bones, but no remains of any burial chamber or coffin could be identified.

17.2.3 Archaeological and palaeobotanical evidence for human diet

No faunal remains were recovered during the excavations at Boyanovo, so there is no direct zooarchaeological evidence of potential food species at the site itself. Nevertheless, general dietary indicators can be sought from the regional Bronze Age archaeological record, specifically from other sites affiliated with the Pit Grave cultural complex. Further environmental and dietary indicators can be found in the palaeobotanical record of the Thracian Plain and surrounding regions.

With the development and spread of the Pit Grave cultures in the Early Bronze Age, archaeological and palynological evidence from southwestern Bulgaria indicate a reduction in the number and size of settlements in the region (Marinova *et al.* 2012). This trend is seen more broadly across the Balkans and throughout central Eurasia; the recovery of few settlement sites, together with evidence for increasing aridity and the development of wheeled transport, is thought to correlate with an increase in population mobility and a corresponding focus on ovicaprid and bovine pastoralism through the Bronze Age (*e.g.*, Shilov 1989, 124; Bunyatyan 2003). Palaeobotanical work in the Thracian Plain indicates that pastoral rather than agricultural activities were drivers of the gradual deforestation of the region from the Early to the Late Bronze Age (Chapter 17 in this volume; Marinova *et al.* 2012; Connor *et al.* 2013). However, there appears to be consensus among archaeologists that agricultural activities also formed a significant – if highly geographically and culturally variable – component of the food production economy among Pit Grave and affiliated communities in the Bronze Age. Studies of grain imprints on pottery recovered from north and west Pontic Bronze Age contexts indicate that a range of cereals and pulses, including varieties of wheat, barley, hemp, and millet, were cultivated throughout this period, with millet cited as increasingly and particularly important (*e.g.*, Pashkevich 2003; Bunyatyan 2003).

The zooarchaeological assemblages of Pit Grave culture sites throughout their distribution are dominated by terrestrial domesticates, namely ovicaprids, cattle, and horses, further reinforcing the view that these animals played a central role in the subsistence economy of Bronze Age steppe and border-steppe societies (Shilov 1989,124; Matyushin 2000; Bunyatyan 2003; Gerling 2015, 233–4). While an economic reliance upon cattle, ovicaprids, and horse appears as a general trend across Eurasian steppe and border-steppe regions in the Bronze Age, the degree to which daily human diet relied upon these and other food sources on both a regional and local scale is poorly understood (see Privat 2004; Gerling 2015). In addition, the relative paucity of settlement sites during this period presents a challenge in understanding the everyday aspects of Bronze Age life, as much of the archaeological information comes from ritual rather than domestic contexts (Rassamakin 1999, 131).

Viewed as a whole, the archaeological and palynological evidence available to date indicates that the individuals from Boyanovo analysed in this study would be considered most likely to have been agro-pastoralists practising a mixed economy incorporating both animal husbandry and a small to intermediate scale agricultural component (as described by Gershkovich 2003; Bogaard 2004; Connor *et al.* 2013).

17.3 Palaeodietary analysis

17.3.1 *Purpose and advantages*

With an incomplete palaeobotanical record and poor local settlement data across Bronze Age Bulgaria, it is difficult to assess aspects of daily life such as average diet with anything but broad generalisations. Stable isotope analysis of human and faunal bone collagen is a useful tool for identifying subsistence patterns supporting the society that produced the Boyanovo burials, as well as comparing dietary trends there with contemporaneous populations across Eurasia. Stable carbon and nitrogen isotope analysis of bone collagen is a well-established technique that has been used to examine dietary trends between individuals and within and between populations across a range of contexts and time periods. Carbon and nitrogen stable isotopes of extracted bone collagen have been shown to reflect overall dietary carbon and nitrogen isotopic composition over the last years of a person's life (Libby *et al.* 1964; Stenhouse and Baxter 1979; Ambrose 1993). This trend allows the contribution of isotopically distinct dietary components to be assessed relative to one another (*e.g.*, Tauber 1981; Katzenberg *et al.* 1995; Katzenberg and Weber 1999). Stable isotope ratios are measured relative to internationally recognised standards, which vary according to the element and material analysed. In this study, atmospheric nitrogen (AIR) and Vienna Pee Dee Belemnite (VPDB) standards are used for nitrogen and carbon stable isotope values, respectively. These ratios are reported in units permil (‰), or parts per thousand, as a delta (δ) value as follows: δX (‰) = $(R_{sample}/R_{standard} - 1) \times 1000$ where X is the heavier of the two isotopes measured and R is the ratio of the heavier to the lighter isotope (Hoefs 1997).

17.3.1.1 *Nitrogen stable isotopes: trophic level indicator*

When an animal ingests and metabolises any type of food, some of the food's constituent molecules are retained in the body of the animal, and are used to build and repair body tissues. Nitrogen and carbon containing molecules make their way through the food chain from plants to herbivores to carnivores to secondary carnivores as they are incorporated into the body of each consumer. Analysis of $\delta^{15}N$ values in animals at different levels of the food chain has led to the identification of a 'trophic level effect'. The $\delta^{15}N$ value of an animal's body proteins has been observed to be enriched in ^{15}N by approximately 3–5‰ relative to its dietary protein (Minagawa and Wada 1984; Schoeninger and DeNiro 1984; Schoeller *et al.* 1986; Ambrose 2000; Hedges and Reynard 2007). Thus, the $\delta^{15}N$ value of a herbivore's bone collagen is about 3–5‰ higher than the $\delta^{15}N$ of the plants it consumes, and the $\delta^{15}N$ of omnivore/carnivore bone collagen is elevated by ~3–5‰ relative to the $\delta^{15}N$ of the animals and/or animal products consumed. The diet-consumer $\delta^{15}N$ trophic level shift has been instrumental in investigating the relative contributions of potential dietary resources such as terrestrial herbivores, terrestrial omnivores, and freshwater fish in the diets of Bronze Age Eurasian populations (Privat 2004; Honch *et al.* 2006; Gerling 2015). The nitrogen stable isotope values of the Boyanovo Bronze Age humans were examined to investigate their place in the local food chain, in particular the extent to which they relied upon their terrestrial domesticates (cattle, ovicaprids, and horse) for their daily diet.

17.3.1.2 *Carbon stable isotopes: C_3 vs. C_4 and marine consumption*

Consumer $\delta^{13}C$ values can provide a broad picture of the plant types that form the foundation of the local food web. Plants that utilise the C_3 photosynthetic pathway (such as trees, shrubs, and most herbaceous plants) have an isotopically distinct $\delta^{13}C$ range relative to their counterparts that use the C_4 photosynthetic pathway (such as tropical and arid-adapted savanna grasses), with C_3 plants exhibiting a mean of ~–27‰ to –28.5‰ (Kohn 2010) and C_4 plants yielding less depleted $\delta^{13}C$ values averaging ~–14‰ (DeNiro 1987; O'Leary 1988). These isotopic differences are passed up the food chain, with an observed diet-consumer trophic shift for collagen $\delta^{13}C$ of approximately +5‰ for herbivores and ~+1‰ for omnivores and carnivores (van der Merwe 1982; Bocherens and Drucker 2003).

Marine fish and mammals tend to show significant enrichment in $\delta^{13}C$ and $\delta^{15}N$ values relative to terrestrial animals (Chisholm *et al.* 1983; Richards and Hedges 1999). Humans with a predominantly marine diet also have stable carbon and nitrogen isotope values much higher than those with a terrestrial diet (Schoeninger *et al.* 1983). The ~8‰ difference between mean marine and terrestrial animal $\delta^{13}C$ can be traced back to the comparable difference in the $\delta^{13}C$ of atmospheric CO_2 (~–7 to –8‰) and the $\delta^{13}C$ of dissolved CO_2 in the ocean (~0 to +1.5‰), which are taken up by plants and blue-green algae at the base of the food chain (Pate 1994; Hoefs 1997). The overlap in stable carbon isotope values between individuals consuming marine and C_4 foods is potentially confusing, but the corresponding examination of $\delta^{15}N$ values can be used to discriminate between enriched $\delta^{13}C$ values due to C_4 as opposed to marine consumption. While consumers of purely marine or C_4 resources may both exhibit $\delta^{13}C$ values as enriched as ~–12‰ to –10‰, C_4 terrestrial consumers will exhibit $\delta^{15}N$ values of up to ~10‰, while frequent consumers of marine resources will generally exhibit much more elevated $\delta^{15}N$ values, potentially as high as ~22‰ (Schoeninger and DeNiro 1984; Richards and Hedges 1999).

The isotopic distinction between C_3 and C_4 plants has been used to investigate the deliberate exploitation (including cultivation) of economically important C_4 plant species such as corn and millet in prehistory (*e.g.*, Katzenberg *et al.* 1995; Liu *et al.* 2012). The essentially

C_3 nature of the environment around Boyanovo provides an opportunity to investigate the exploitation of C_4 plants (*e.g.*, millet, *Panicum miliaceum*) by the local Bronze Age population. Regular consumption of millet (gathered or cultivated) or of animals grazed on or fed millet should cause human $\delta^{13}C$ values to be significantly enriched (*i.e.*, less negative) relative to reference fauna that exhibit typical C_3 carbon stable isotope values. Using the model proposed by van der Merwe (1982), C_4 dietary contributions would be detectable isotopically once at least 20% of the individual's dietary protein came from a C_4 source (plants or animals), resulting in a consumer collagen $\delta^{13}C$ value of ~–18‰. An evenly mixed C_3–C_4 diet would produce consumer $\delta^{13}C$ values of around –14‰, while a fully C_4 diet would theoretically result in a $\delta^{13}C$ value of approximately –10‰ (van der Merwe 1982; Katzenberg *et al.* 1995).

17.3.2 Materials and methods

Samples of cortical bone were taken from 14 individuals recovered from mounds 8007 and 6009 of the Boyanovo mortuary complex. All sampled individuals were adults (ca. 16 years or older) according to osteological indices (*cf.* Bass 1995). Juveniles were not sampled for this study, as their bones retain an elevated nitrogen isotope signal as a result of nursing for years after weaning, potentially producing confusing results (Balasse *et al.* 1997; Schurr 1997). The surface of each sample was cleaned by manual abrasion using a sterile scalpel blade. Collagen extraction was performed using a modified Longin (1971) method (Bronk Ramsey *et al.* 2004). Samples were demineralised in 1M HCl at –4°C; the acid was drained and replenished every few days until bubbles no longer formed, indicating that demineralisation was complete. The supernatant was then poured off and the residue washed five times with Milli-Q water to remove any excess acid and water-soluble impurities. Acidic water (pH=3, Milli-Q water + HCl) was added to each demineralised sample in a glass tube; samples were then gelatinised by heating at approximately 75°C for 48 hours in a hot block. The gelatinised collagen in solution was isolated using an Ezee filter (Elkay Laboratory Products Ltd, Basingstoke, UK). The filtrate (~8 ml) was transferred to clean plastic test tubes, frozen at –80°C, and then freeze dried. Samples were analysed in duplicate by OEA Labs (UK) using an elemental analyser coupled to an isotope-ratio mass spectrometer. Carbon:nitrogen (C:N) values of 3.1 to 3.2 were obtained for all samples, indicating good collagen preservation (DeNiro 1985). Analytical error was reported as 0.3‰ (1 SD) for both carbon and nitrogen; however, since sample duplicates varied up to 0.5‰, the latter value is used as a more conservative error estimate. By convention, carbon values ($\delta^{13}C$) are reported relative to the Vienna Pee Dee Belemnite standard (VPDB); nitrogen values ($\delta^{15}N$) are reported relative to atmospheric nitrogen (AIR).

Faunal stable isotope data is required against which to compare the Boyanovo human data. Since no faunal samples were available from Boyanovo, comparative data from Privat (2004) was used. In the reference faunal dataset, terrestrial carnivores are represented by five dog (*Canis familiaris*) and wolf (*Canis lupus*) and five fox (*Vulpes vulpes*) samples. Potential faunal food species are represented by 85 cattle (*Bos taurus*), 86 ovicaprid (*Ovis aries, Capra hircus,* and unidentified ovicaprids), 27 cervid (*Alces alces, Capreolus capreolus,* and *Cervus elaphus*), 63 horse (*Equus caballus*), 20 pig (*Sus scrofa*), and 27 freshwater fish (*Esox lucius, Perca fluviatilis, Carassius carassius,* and indeterminate species) samples. All faunal samples were recovered from Eurasian steppe or forest-steppe environments, and exhibited isotope values typical of temperate C_3 ecosystems. The environment around Boyanovo, located in southeastern Bulgaria, would have been comparable to those described by Privat (2004), ranging between C_3 dominated forested to open ecosystems (see Chapter 13 in this volume). The faunal dataset provided by Privat (2004) can be considered a valid regional and chronological comparative baseline for this study.

In order to further investigate the potential exploitation of dietary resources including C_4 plants such as millet at Bronze Age Boyanovo, the human stable isotope values obtained in this study were compared with those of other populations. For this, groups from Eurasia were chosen, dated from the Mesolithic to the Iron Age, for which multiple lines of evidence (both archaeological and isotopic) support a specific dietary regime. Comparative data were sought from sites at which aridity and salinity were unlikely to be so high as to cause significant isotopic enrichment (Farquhar *et al.* 1989; Tieszen 1991; Page 1995; Grcke *et al.* 1997), and at which associated faunal data are comparable to our faunal reference set. The sites of Herxheim and Trebur (Neolithic Germany; Dürrwächter *et al.* 2006) were selected as representative of a diet heavily reliant upon C_3 plants and animals, while the Middle–Late Bronze Age site of Olmo di Nogara in northeastern Italy was chosen as a site at which regular C_4 (*i.e.*, millet) consumption is indicated (Tafuri *et al.* 2009). The sites of Chicha (Late Bronze Age southwestern Siberia; Privat *et al.* 2005) and Vlasac and Schela Cladovei (Mesolithic Iron Gates region; Bonsall *et al.* 1997) are used as representatives of high freshwater fish consumption, supplemented by terrestrial faunal protein.

17.3.3 Results

The $\delta^{13}C$ and $\delta^{15}N$ results for the Boyanovo humans are given in the digital dataset.[1] The Boyanovo humans exhibited $\delta^{15}N$ values ranging from 9.4‰ to 12.1‰, and $\delta^{13}C$ values from –20.1‰ to –16.6‰. Among the individuals sampled, no dietary trends could be identified that correlated with sex. Both males and females exhibited values at or near the minimum and maximum limits of

the isotopic dataset. No systematic differences between age categories or groups thereof are apparent.

In order to simplify the categories of potential dietary resources represented by the faunal dataset, some species are grouped in higher taxonomic categories where related species exhibit similar stable isotope profiles, and represent similar modes of resource exploitation (pigs/boars = non-ruminant terrestrial omnivores; cattle/ovicaprids = ruminant terrestrial domesticates; horses = non-ruminant terrestrial domesticates; cervids = non-ruminant terrestrial wild fauna).

When compared with the reference faunal dataset from Privat (2004), the Boyanovo humans exhibit δ^{15}N values similar to those of dogs, wolves, and foxes – terrestrial predators/scavengers with a diet high in terrestrial protein (Fig. 17.4).

Given an expected δ^{15}N trophic level enrichment of 3–5‰ between diet and consumer, the human δ^{15}N values lie entirely within the range predicted for consumers of domestic ruminants (cattle and ovicaprids), and overlap with the ranges predicted for consumers of other terrestrial herbivores and omnivores (Fig. 17.5). With the possible exception of the highest human δ^{15}N values, frequent fish consumption is not indicated for the Boyanovo population.

Most of the humans included in this study were dated to periods from the Early Bronze Age to the Early Iron Age. These individuals exhibit a consistent spread of stable carbon and nitrogen isotope values, indicative of a heterogeneous dietary regime incorporating differing amounts of or types of animal protein, as well as variable amounts of C_4 foods (Fig. 17.6). The individual of indeterminate date recovered from mound 8007 is an isotopic outlier with the highest δ^{15}N value obtained (12.1‰), reflective of a diet including animals enriched in ^{15}N such as pigs/boars, fish, or both. The lowest δ^{15}N value was obtained from the Classical–Roman human, though this individual's value (9.4‰) falls among the less enriched of the Early Bronze to Early Iron Age δ^{15}N values.

Figure 17.7 shows the relationship of the Boyanovo human palaeodietary data to those from the comparative Eurasian sites. Individuals from the reference sites with a diet based on terrestrial and aquatic C_3 resources exhibit δ^{13}C values between –21‰ and –18‰ (Bonsall *et al.* 1997; Privat *et al.* 2005; Dürrwächter *et al.* 2006). A diet high in millet is indicated for the Middle-Late Bronze Age population at Olmo di Nogara (Tafuri *et al.* 2009; northeastern Italy), with human δ^{13}C values ranging from approximately –18‰ and –14‰.

The Boyanovo human δ^{13}C values do not cluster closely with any one of the other sites, but rather spread between groups reflecting distinctive subsistence regimes. At the more depleted (negative) end of the Boyanovo δ^{13}C data, the individuals fall among the values obtained for the Neolithic humans at Herxheim and Trebur (Dürrwächter *et al.* 2006), where the archaeological evidence, coupled

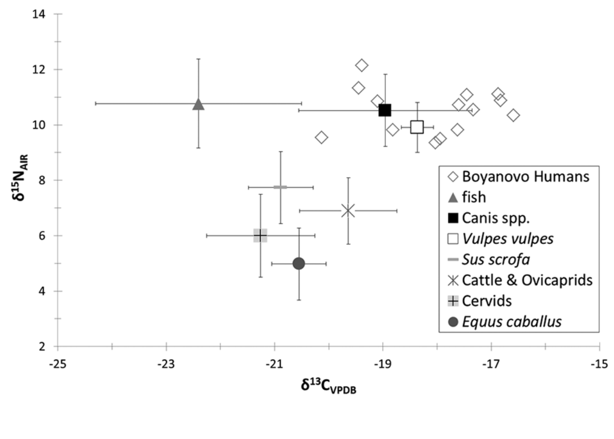


Figure 17.4 The human δ^{13}C and δ^{15}N data obtained in this study of the Boyanovo burial mound, with comparative faunal data from Eurasian steppe and forest-steppe sites (Privat 2004) for reference. Faunal data are plotted as the average for each group ±1 standard deviation.

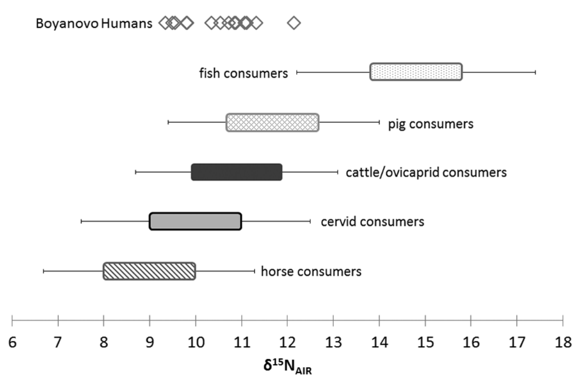


Figure 17.5 Human δ^{15}N values plotted against predicted δ^{15}N ranges for potential dietary resources. Ranges are +3–5‰ the average δ^{15}N value for each faunal group, error bars represent ±1 standard deviation of the original δ^{15}N dataset for each group.

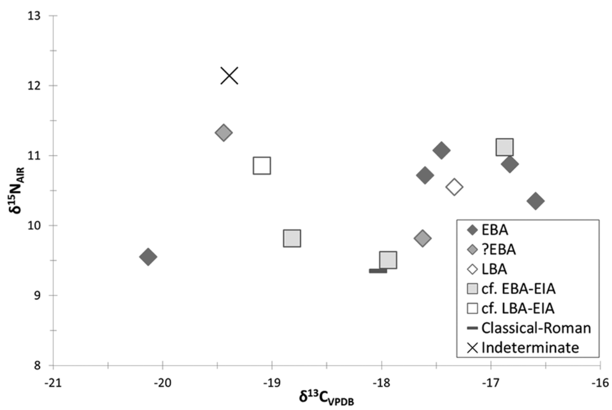


Figure 17.6 δ^{13}C and δ^{15}N values for the Boyanovo humans by period.

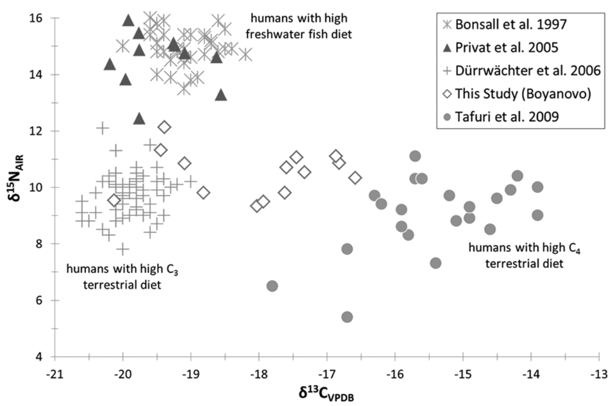


Figure 17.7 A comparison of the palaeodietary data from Boyanovo to data from other Eurasian sites (see text for references).

with the palaeodietary data, indicate a C_3 diet based on cultivated crops and terrestrial faunal protein. Only the most enriched of the Boyanovo $\delta^{15}N$ values are suggestive of some degree of regular freshwater fish exploitation. The less depleted Boyanovo human $\delta^{13}C$ values overlap with those of individuals from Olmo di Nogara (Tafuri *et al.* 2009), which are estimated to have consumed a mixed C_3–C_4 diet of up to ~50% C_4 resources (plants and/or animals with C_4 diet).

17.3.4 Discussion

Except for two samples, the palaeodietary data reported here represent individuals dated (at least provisionally) to the Early Bronze Age to the Early Iron Age. Groupings within the dataset were not evident, either between males and females or among different age categories. Given the limited sample size, particularly when examining trends in relation to age (14 samples divided into seven broad and often overlapping age categories), it is entirely possible that patterns may emerge as more palaeodietary data is produced.

17.3.4.1 Animal protein consumption

The isotopic data indicate that the humans at Boyanovo relied on animal protein (meat and/or milk) as a dietary staple. Specifically, the $\delta^{15}N$ data reflect a diet based on terrestrial rather than freshwater animals (*e.g.*, fish). While previous palaeodietary research has suggested that some Bronze Age Ukrainian, Trans-Uralian, and southwest Siberian populations exploited freshwater fish as a major foodstuff (Privat 2004), the results of this study show that this was not the case for the individuals studied from Early Bronze to Early Iron Age Boyanovo. Nevertheless, the spread of $\delta^{15}N$ values suggests a certain variability in the frequency and type of animal protein consumed across the time periods represented in this dataset.

One outlier within the Boyanovo population is the only undated sample included in the analysis, which yielded a $\delta^{15}N$ value nearly 1‰ higher than any of the other Boyanovo individuals. With a $\delta^{15}N$ value of 12.1‰, it is likely that this individual consumed foods elevated in $\delta^{15}N$, such as pig/boar or freshwater fish, more frequently than the other individuals analysed from Boyanovo.

The mean $\delta^{15}N$ value for the reference cattle and ovicaprid samples is 6.9‰±1.2‰ (1 SD). Given a diet-consumer enrichment of 3–5‰, the expected $\delta^{15}N$ range for humans consuming these ruminant domesticates is approximately 9.9‰ to 11.9‰ ±1.2‰. The Boyanovo humans yielded $\delta^{15}N$ values of 9.4–12.1‰, which fall entirely within the range of potential cattle/ovicaprid consumers. While the correspondence between the Boyanovo human data and the predicted range for cattle/ovicaprid consumers points to frequent consumption of these animals, other terrestrial fauna cannot be excluded as potentially important dietary resources. The predicted $\delta^{15}N$ range for pig/boar consumers and that of cervid consumers show considerable overlap with the human $\delta^{15}N$ range. Most of the Boyanovo human $\delta^{15}N$ values do also fall within our conservatively estimated range for horse consumers, but the large difference in average stable nitrogen isotope values for humans and horses (5.5‰) does suggest that horse meat and/or secondary products were not regularly consumed by most of the Boyanovo population.

The lowest Boyanovo $\delta^{15}N$ values could be explained by some consumption of horse or cervid products, but these values would also result from eating more plants and less animal protein than the average population. The only individual included in this study assigned to the Classical Antiquity exhibited the lowest $\delta^{15}N$ value, indicating little, if any, consumption of aquatic or porcine foods and a more frequent consumption of low-^{15}N foods such as plants (or possibly horse/cervid products).

17.3.4.2 Evidence for millet consumption

The carbon stable isotope values of humans from Boyanovo are striking in that many clearly diverge from the range expected for consumers of C_3 resources. The most depleted Boyanovo $\delta^{13}C$ values correspond to those of typical C_3 consumers, such as the Neolithic populations from Herxheim and Trebur reported by Dürrwächter *et al.* (2006). However, most samples from Boyanovo exhibit collagen $\delta^{13}C$ values that differ significantly from these 'C_3 consumer' values. A theoretical threshold $\delta^{13}C$ value of –18‰ for consumer collagen has been suggested, above which C_4 consumption can be positively detected (van der Merwe 1982; Pearson *et al.* 2007; Lightfoot *et al.* 2013). As with the Middle–Late Bronze Age humans from Olmo di Nogara (Tafuri *et al.* 2009), most of the individuals from Boyanovo (nine of 14) exhibited $\delta^{13}C$ values at or above –18‰. Values more negative than the –18‰ threshold do not necessarily represent an entirely C_3 based dietary regime, but may be the result of C_4 consumption at a frequency below detection. Roughly

estimated, individuals consuming less than approximately 20% C_4 (or marine) foods may not yield $\delta^{13}C$ values distinct from those consuming exclusively C_3 resources (van der Merwe 1982; Hedges 2004). Frequent marine food consumption could potentially be invoked to explain enriched $\delta^{13}C$ values, but the individuals from Boyanovo with the highest $\delta^{13}C$ values lack correspondingly elevated $\delta^{15}N$ values characteristic of marine consumers. The incidental consumption of marine fish as well as the consumption of low trophic-level marine foods such as molluscs or seaweed cannot be ruled out according to the stable isotope data. However, given the inland nature of the site and the occurrence of C_4 species in the area during the Bronze Age and subsequent periods, the data point toward a mixed C_3–C_4 diet at Boyanovo, with C_4 plants (*i.e.*, millet) entering the food chain through direct consumption, via products obtained from fauna raised on a diet with a significant C_4 component, or both.

17.4 Conclusion

This palaeodietary investigation indicates a human diet high in terrestrial animal protein and low in aquatic resources (*e.g.*, fish). Furthermore, the data suggest a diet with variable C_4 input, ranging from dominantly C_3 foods to a mixed C_3–C_4 regime. C_4 input may result from direct consumption of C_4 plants (*i.e.*, millet) or by eating C_4 consuming animals (and/or their secondary products). Considering the archaeological evidence for an economy focused on ovicaprid (and to a lesser extent) bovine pastoralism, the isotopic data seem to reflect a diet high in ovicaprid and/or bovine products (meat and/or dairy), although a dietary contribution from other terrestrial omnivores and herbivores cannot be excluded. These results correspond to palaeodietary data obtained from other Bronze Age to Iron Age sites in the Balkans (Gerling 2015, West Pontic Bulgaria; Lightfoot *et al.* 2015, coastal and inland Croatia), which identify variable levels of millet consumption and a consistent reliance upon terrestrial fauna as a major protein source through the Bronze Age. As the palaeodietary datasets continue to expand, researchers will be able to address issues such as differential access to dietary resources (by status, sex, and/or age) or extent of millet exploitation in the Balkans and western Eurasia more comprehensively.

Acknowledgements

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Notes

1 Contextual, descriptive and palaeodietary information for all human remains recovered from the Boyanovo excavations – DOI:https://doi.org/10.6078/M7BC3WM7

2 The numbers in excavators' diaries for these burials were originally listed 19, 19/2, and 19/3 (mound #1) to 19, 21, 22 in some diary entries; the available photos show 20.2 for the earliest adult and child burial. These numbers were standardised during follow-up processing to 19, 21, and 22.

18

Excavations at the Roman site of Stroyno-Yurta, Yambol province (2014–2015): an interim report

Petra Tušlová, Barbora Weissová, and Stefan Bakardzhiev

Abstract *Trial excavations at the Roman site of Stroyno-Yurta conducted by the Yambol History Museum during 2006 and 2007 identified it as a veteran settlement dating between the first and fourth centuries AD. In 2009, the Tundzha Regional Archaeology Project (TRAP) surveyed the accessible parts of the site, revealing extensive and ongoing looting. Consequently, in 2014–2015 the Stroyno Archaeology Project (SAP), a cooperative effort involving the Yambol History Museum and the Institute of Classical Archaeology at Charles University in Prague, excavated to establish the site's chronology and character before it was damaged further. This investigation revealed the foundations of a five-room structure, probably a house with a shop or workshop, occupied in the third century AD, which was part of a long-lived settlement founded in the mid-second century and abandoned sometime after the house was levelled.*

Keywords *excavation; settlement; Roman Thrace; vicus; Stroyno-Yurta*

18.1 Introduction

Tundzha Regional Archaeology Project (TRAP) survey in the Elhovo study area during 2009 was followed in 2014 by the Stroyno Archaeological Project (SAP), which excavated the previously known Roman site that TRAP designated as surface concentration 6018 (see Yambol site catalogue).[1] This concentration is located in the 'Yurta' locale, some 1.5 km northeast of the village of Stroyno (Fig. 11.1). The site is known in the literature under the name of 'Stroyno' based on informant reports from 1978 and limited rescue excavations conducted during 2006 and 2007 (Dimitrova and Popov 1978; Bakardzhiev 2008; 2007). In this chapter, we refer to the site as 'Stroyno-Yurta' in order to differentiate it from other archaeological sites in the vicinity, one of which was recently excavated by Daniela Agre (Agre, Dichev, and Christov 2015, 208–10). The ancient name of the settlement is unknown.

Earlier rescue work in 2006–2007 had been instigated by reports of egregious looting. These excavations were small-scale, but identified the site as a Roman veteran's settlement (Bakardzhiev 2007, 240). The significance of the site, combined with observations of further looting during the 2009 TRAP survey, inspired a team of archaeologists from the Yambol History Museum and doctoral students from Charles University in Prague, Czech Republic, to resume excavations at the site. While these investigations were not a formal part of TRAP, they were informed by the survey and represent the sort of follow up investigations that TRAP hoped to encourage.

SAP sought to refine understanding of Stroyno-Yurta's chronology and function. To do so, the authors excavated nine trenches at the site during 2014 and 2015, revealing the remains of a five-room building. While the stratigraphy was disturbed by looting, and most intrinsically valuable objects removed, sufficient cultural material and a few isolated areas with intact stratigraphy remained, allowing the structure to be dated to the third century AD. The building was probably damaged by flooding from the nearby Dereorman River and subsequently levelled. Some of the finds indicated that the settlement as a whole had a longer life, beginning in the first half of the first century and ending sometime after the abandonment of the house. Finds supported the interpretation of the site as a veteran's settlement.

18.2 Physical setting

Stroyno-Yurta lies on the northern bank of the Dereorman River, an eastern tributary of the Tundzha River. The northern part of the site lies in agricultural fields on

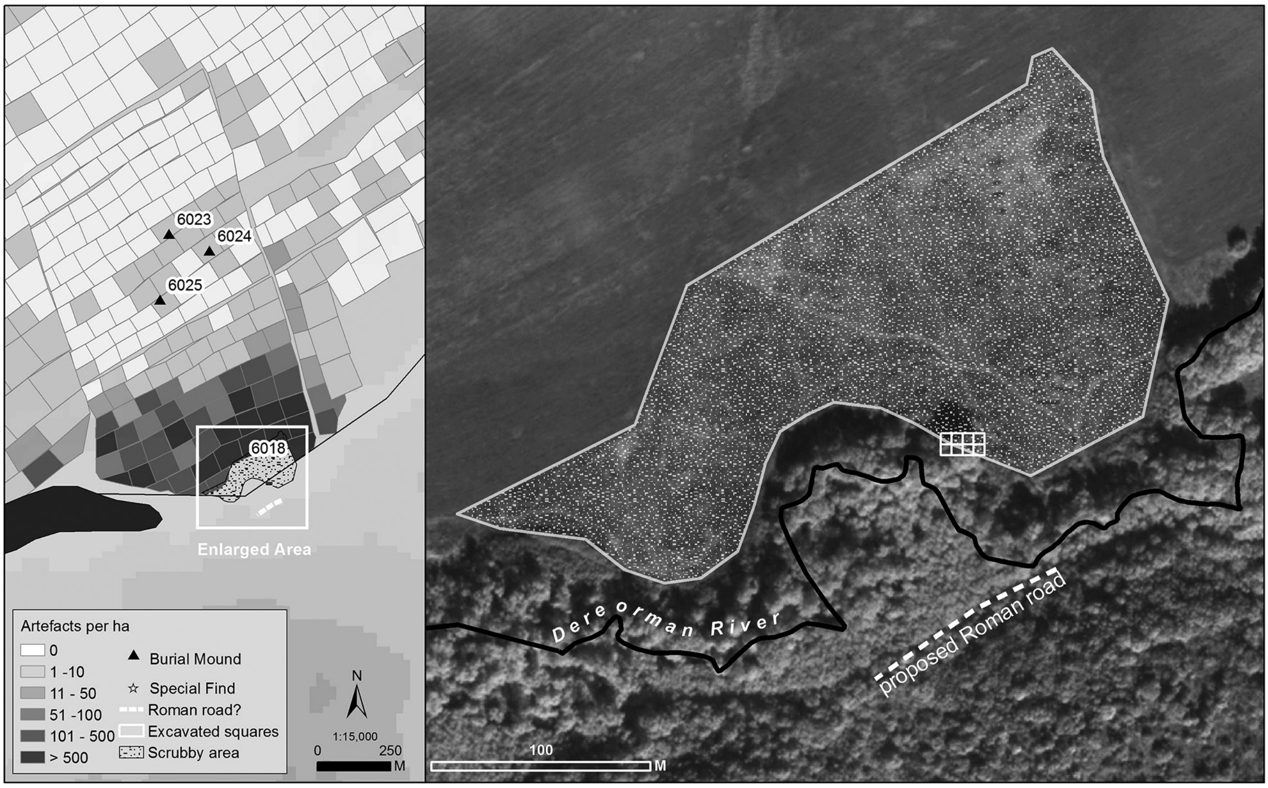

Figure 18.1 Detail view of the site extent. Survey results left; trenches excavated in 2014–2015 right.

a gently sloping hill. Here, TRAP recorded a dense concentration of pottery and architectural ceramics spanning ca. 17 ha. The southern part of the site included an overgrown area of some 3.5 ha with open looters' trenches along the river bank. This disrupted area, plus the lower density margins of the site, extend the overall surface remains to ca. 30 ha (Fig. 18.1).

The Dereorman River forms the site's southern boundary. Worked stones, architectural ceramics, and pottery appear along the riverbed and continue into the water. While the Dereorman River is only 3 m wide and 1 m deep, its channel has disturbed the southern periphery of the site. Across the river to the south, the terrain rises again to form the highest ridge in the area, Bakadzhik Hill (283 masl). The hillside is rocky and unyielding, which prevents the river from meandering in a southerly direction.

When the river overflows its channel during floods or after snowmelt (*cf.* Chapter 11), it inundates the lower portions of the site. As no excavations were undertaken alongside or across the Dereorman River, the southern limit of the site is unknown.

18.3 Regional connections during the Roman Empire

Stroyno-Yurta is situated deep in the interior of the Roman province of Thrace, connected with the Mediterranean via the Tundzha River (ancient *Tonzos*), 12 km west of the settlement. The Tundzha River was navigable in antiquity, linking the northern part of the province with Hadrianopolis, where it joins the Maritsa River (ancient *Hebros*), which itself then issues into the Aegean Sea at Aenos. The principal road, most likely built during the reign of Emperor Trajan (AD 98–117), followed these rivers for much of their length (Madzharov 2009, 237). This road began near the Aegean at Aenos, situated on the Maritsa River estuary (Fig 18.1). From there it followed the Maritsa River to Hadrianopolis, and then the Tundzha River past Stroyno-Yurta to Kabyle. From there it left the Tundzha River, which bends westward, to pass northward through the Roman *mansio* at Tuida and Sub Radices, where it joined the larger road from Philippopolis (modern Plovdiv) to Oescus in Moesia, before continuing north as far as the Danube River (see Madzharov 2009, 231). As such, Stroyno-Yurta was situated near an important north–south road connecting Thrace with Moesia Inferior. Smaller roads presumably connected settlements such as Stroyno-Yurta to the Trajanic road. Indeed, Bulgarian tradition places a subsidiary Roman road along the Dereorman River, running in an east–west direction along the lower slopes of Bakadzhik Hill (Fig. 18.1), although no trace of it has been found archaeologically. The nearest cities to Stroyno-Yurta were Kabyle, 40 km to the north, and Hadrianopolis, 60 km to the south.

18.4 Local archaeological context

The rolling landscape around Stroyno-Yurta abounds with archaeological remains from the Roman era. Six Roman period surface artefact concentrations containing

architectural ceramics have been reported in the 69 sq km encompassed by the neighbouring Borisovo and Boyanovo municipalities, 4.5 km east and 4.5 km west of Stroyno respectively (Dimitrova and Popov 1978, 16, 26; pl. 7; Yambol site catalogue).[2] Only one of these other sites, Sv. Ilija, located east of Stroyno, had been excavated at the time of writing. Based on initial observations, it was interpreted as a Roman villa, presumably contemporary with Yurta (Agre, Dichev, and Christov 2015, 208–10). The remaining five surface concentrations still await investigation, but imply habitation during the Roman period.

As of 2014, 66 burial mounds have also been documented within the municipalities of Stroyno, Borisovo, and Boyanovo. Only 16 of them had been excavated. Roman graves dating from the second half of the first to the beginning of the third century AD were identified in 12 of these mounds (Tancheva-Vasileva 1984, 69–76; Agre 2007a, 76–7; 2008a, 237–9; 2009, 279–82; 2010, 251–3; 2012, 217–19; 2013, 164–6; Bakardzhiev 2009, 3–5; Bakardzhiev *et al.* 2011, 117). The burial mounds usually contain more than one burial. Many of these burials included impressive grave goods indicating elite status, such as a funeral carriage with yoked horses (Agre 2009, 280; 2012, 218) and a sarcophagus with offerings (Agre 2007a, 76–7; 2008a, 237–9). The abundance of funerary monuments in the area, in combination with a Roman villa and another five Roman habitations, attest to a thriving rural landscape around Stroyno-Yurta.

18.5 Previous investigations

The remains of a Roman site at Stroyno-Yurta were first mentioned in the *Gazetteer of archaeological monuments in the Yambol district* in 1978: 'during agricultural activities foundations of houses, architectural ceramics and dense scatter of Roman pottery were revealed' (Dimitrova and Popov 1978, 26, cat. no. 162). Since the site's discovery, over 50 significant finds have been recovered from Stroyno-Yurta. The most important is a fragment of a bronze military diploma for a veteran of the *classis Misenensis* (fleet of Misenum), dated between AD 152 and 158 (Boyanov 2006, 239; 2007, 69–74, see Chapter 21 and Yambol inscriptions catalogue, no. Y23).[3] Others include a hoard of 29 silver coins from the first half of the third century AD (Bakardzhiev 2007, 238–9), a marble type I Roman Doric capital, usually dated to the first and early second century AD (Bakardzhiev 2007, 238; 2012, 365), and part of a marble stele depicting the Thracian Horseman, bearing a Greek inscription mentioning a Latin name *Avilii* (mentioned by Bakardzhiev 2008, 472 and Boyanov 2008, 214, but otherwise unpublished).

Unfortunately, coins and other precious metals at the site attracted the attention of looters. The looters have searched the site using metal detectors and dug numerous trenches. When this looting was reported, the Yambol History Museum undertook rescue excavations (2006–2007), focusing on the most affected areas (Bakardzhiev 2007, 238–41; 2008, 471–3). Although limited in extent, these excavations confirmed occupation of the site between the first and fourth centuries AD (see below).

In 2009, Stroyno-Yurta was within the Elhovo study area of TRAP survey. Field walkers systematically surveyed the entire slope north of the Dereorman, delineating the boundaries of the surface scatter at the site, designated 6018 (Iliev *et al.* 2012, 22). The margins of the concentration covered ca. 30 ha, with the densest concentration spanning ca. 17 ha in cultivated fields (see site 6018 and density maps in the Yambol site catalogue; *cf.* Fig. 18.1).[2] Roman pottery and architectural ceramics dominated the scatter, with a few handmade, prehistoric fragments and post-Roman sherds also found. The surveyors noted many fresh robber's trenches in the southern, overgrown part of the site, testament to continued looting.

The promising results of the 2006–2007 rescue excavations, the contextualisation of the site by TRAP survey, and ongoing problems with looting raised interest in Stroyno-Yurta. These developments led to the initiation of the Stroyno Archaeological Project in 2014 by the Yambol History Museum and the Institute of Classical Archaeology at Charles University, Prague. Its three-year plan (2014–2016) included excavating a section of the site to investigate settlement history, chronology, extent, and function (see below).

18.5.1 2006–2007 excavations

In 2005, local informants from the village of Stroyno reported that looters had dug some 60 trenches in the vicinity of the Dereorman River during 2004. These reports led staff of the Yambol History Museum, directed by Stefan Bakardzhiev and Ilija Iliev, to begin rescue excavations in disturbed areas at Stroyno-Yurta. These excavations, conducted in 2006 and 2007, aimed to assess the damage and reconnoitre the site (Bakardzhiev 2007, 238–241; 2008, 471–3).

During 2006, the excavators spent six days at Stroyno-Yurta, excavating two trenches 1 m deep, placed some 50–60 m apart. The first trench measured 1.2×10 m, the second 2.5×3 m. In both trenches, there was about 0.5 m of topsoil, followed by three or four contexts. Both trenches revealed walls made from local stone with earth bonding. Recovered ceramics dated from the first to the fourth centuries AD, with the third century best represented (Bakardzhiev 2007, 240).

During 2007, the excavators spent another five days at the site, opening two additional trenches. These trenches were placed next to one another, 5 m north of the first 2006 trench; together they covered 37 sq m. Due to limited time, the trenches were excavated only to a depth of 0.60 m. The first cultural layer appeared at 0.25 m, with a second at about 0.55 m. Most of the pottery and small finds from these layers, including a silver *antoninianus* of Emperor Gallienus (AD 253–260), dated to the third century. The finds from 2007 were consistent with those

of 2006. As the resources of the museum were limited, the excavations were closed.

Despite limited time and resources, the 2006–2007 excavations at Stroyno-Yurta identified the site as a Roman settlement occupied from the first through the fourth century. Regardless of severe looting, it could be seen that some cultural layers remained intact.

18.6 The Stroyno Archaeological Project (seasons 2014–2015)

The Stroyno Archaeological Project began in 2014 under the direction of Stefan Bakardzhiev, Yambol History Museum, and Petra Tušlová and Barbora Weissová, both from Charles University. Archaeology students from Charles University worked side-by-side with staff from the Yambol History Museum.[4] Excavations lasted four weeks, followed by three weeks of post-processing and artefact study (for preliminary reports see: Tušlová, Weissová, and Bakardzhiev 2014; Tušlová *et al.* 2015).

18.6.1 Excavation methods

SAP opened nine adjacent 5×5 m trenches in the southwestern area of Stroyno-Yurta, arranged in a grid pattern with balks retained for profiles (see Fig. 18.2). These trenches were situated in an overgrown area with abundant surface material, starting about 2 m east of the Dereorman River, near a stone wall previously exposed by looters that offered a reference point. In areas undisturbed by looters, excavation proceeded stratigraphically, producing contexts. Where stratigraphy had been destroyed by looting, arbitrary spits of 10–20 cm were removed until features like walls or floors, or undisturbed soil, were encountered.

18.6.2 Sieving and sampling

The soil from all undisturbed contexts was sieved using a 1.0×1.0 cm screen to recover small artefacts and bone fragments. Ten litre samples were taken from ten contexts for floatation using a 0.25 mm mesh. The floated materials were sent to the Archaeology Department at the University of Sheffield, UK, for archaeobotanical analyses by Dr Catherine Longford (using the same approach employed at Dodoparon; see Chapter 19). The sample from a single burnt context, situated below the fill in Room B, appeared to be the most promising. The heavy fraction from floatation was deposited in the Yambol History Museum for additional processing later. Charcoal samples from seven contexts were also collected. Severe looting, however, may have compromised their suitability for C14 dating. These samples have also been stored at the Yambol History Museum for later analysis.

18.6.3 Artefact post-processing

Artefacts recovered from each context were divided into groups by material at the site. Pot sherds, architectural ceramics, animal bones, non-diagnostic glass fragments, unworked metals, and wasters were each counted and bagged. Certain artefacts were immediately separated for inventory, including:

- Glass: all diagnostic vessel fragments, beads, window plates, or raw glass;
- Metal: all coins and other worked metal with a recognisable shape;
- Bone: worked bone and bones used for dice (astragals);
- Ceramic: terracotta lamps and figurines (including fragments), loom weights, spindle whorls, beads, and unusually shaped pottery fragments; and

Figure 18.2 Drawing of the excavated area after the year 2015 showing the five-room house and its immediate surroundings.

- Stone: grinding stones, whetstones, crucibles, flaked stone, and fragments of sculpture (reliefs, statues, decorated architectural elements, *etc*.).

Pottery from each context or spit was divided further into several preliminary categories: fine ware, grey ware, coarse ware, common ware, transport amphorae, storage ware, and handmade pottery. Each subgroup was counted, weighed, and photographed. Diagnostic sherds were selected for inventory.

All inventoried artefacts were individually photographed, while selected small finds and diagnostic potsherds were also drawn. A written record, later transcribed into a spreadsheet, was created. All drawings, inventory sheets, and context sheets were scanned into PDF. Excavation journals were also digitised. Digital copies of all site documentation were deposited in the Historical Museum to ensure preservation and accessibility of the primary data. The finds from the site are also stored at the Yambol History Museum.

18.6.3.1 Site and find conservation

After completion of the 2015 excavation, the trenches and walls were covered with thick plastic sheets and back-filled. Several layers of soil-filled bags were placed against exposed walls to stabilise them. As further excavations were planned, these conservation measures were temporary and provisional. Georgi Iliev from the Yambol History Museum undertook conservation of the few vulnerable finds; mostly metals and the head of small marble figurine.

18.7 Results

The nine trenches excavated during 2014–2015 opened an area of ca. 160 sq m. The average depth of excavation was 0.80 m, with maximum depth reaching 1.20 m. Over the course of the excavation, a series of connected stone walls came to light, interpreted as the foundations of five adjacent rooms (labelled from west to east as Rooms A through E). The walls deviate by only 10° from cardinal directions, and were built of local fieldstones bonded (or infiltrated) by soil. They are preserved to a maximum height of 0.80 m, with a maximum width of 0.78 m in their upper sections. All five rooms have similar dimensions, with the largest (Room B) measuring approximately 4.90 m (N–S) × 4.70 m (E–W). The northern wall of the westernmost room runs under a massive tree root, while the corresponding southern wall gradually disappears (Fig. 18.2). Consequently, the westerly extent of the stone structure, and its relation to the Dereorman River flowing just 2 m away, remains unclear. In the east, the southernmost and northernmost walls continue into unexplored areas.

Inside Rooms A, B, C, and E (Fig. 18.2), reverse stratigraphy was encountered, brought about by the activity of looters. This disturbed deposit contained a mixture of Laconian roof tiles (preserved dimensions: ca. 41×59 cm) and various pottery types (mainly tableware, cooking pots, and transport amphorae). Many of the tiles had fresh breaks, having been tossed carelessly into the robber's trenches. The disturbed deposit continued to a depth of 0.70 m. Below this depth in Rooms B and C were two pits, dug in antiquity, that had escaped looting. They contained a mixture of various types of pottery, roof tiles, glass, plaster, animal bones, charcoal, and small iron objects. Their contents appeared to be similar and contemporary; pottery of the same types occurred in both pits, as did blue hexagonal glass beads of similar appearance and dimensions.

Room D had almost avoided disruption by looters. Below 0.35–0.40 m of topsoil, we encountered a thick (0.40–0.50 m) layer containing a large amount of heterogeneous and fragmented material, lying directly on a thin, pavement-like layer of densely packed, subangular stones of variable sizes (from ca. 4–8 cm), interpreted as the original floor. Embedded in this pavement were the remains of terracotta water tubes running north–south, parallel to the west facing wall of Room D.

Likewise, the area to the north of Rooms D and E, outside the building, had not been disrupted by looters. Its stratigraphy revealed the same pattern we encountered inside Rooms D and E: topsoil followed by a layer of mixed fill lying on a stone floor.

18.7.1 Selected finds

Excavations produced a total of five bronze coins.[5] The relatively small number of coins is not surprising, as coins are one of the main targets for looters. Two of these coins proved to be very important – one for interpretation of the site, the other for its date. The first is a coin of Augustus minted 23–21 BC in Ephesus, Asia Minor (see digital figure).[6] The obverse features the head of Augustus facing right with the legend CAESAR, while the reverse has a simple laurel wreath encircling name AVGVSTVS. This coin was found in the north of Room A. This Ephesian coin is very rare in Bulgaria with only nine and a half examples known. Four and a half of these coins were found at the archaeological site of Kabyle, one in the village of Drama, and the last four in unknown areas of southern Bulgaria. This coin was issued to pay Roman soldiers, and may represent an heirloom passed down through a military family. The second coin is of Diadumenian, the young son of Emperor Macrinus (see digital figure).[7] It was issued in Cyzicus, Mysia, Asia Minor, in AD 217–218. On the obverse it features the head of the young Diadumenian facing right with the text in Greek: Μ ΟΠ[ΕΛΙ] ΔΙΑΔΟΥΜΕΝΙΑΝΟΣ [ΚΑ]. On the reverse a calf walking right with the text ΚΥΖ[ΙΚΕ]ΝΩΝ [ΝΕ]|ΩΚΟΡ appears. This coin was found embedded in the stone foundations of the northern wall of Room C (southern face), providing a *terminus post quem* for the single-phase building. Luckily, it escaped the attention of the looters, who did not dig their robber's trench all the way to the wall.

A bronze fibula (type '*Fibeln mit umgeschlagenem Fuss*'; Almgren 162) was found in the topsoil north of Room B (see digital figure).[8] This type was widespread in Rome's Balkan provinces, especially Pannonia, Dacia, and Moesia Superior. Dates for the type range from the end of the second to the beginning of the fifth century, with highest frequency occurring in the third and fourth century (Almgren 1923, 76–7; Ambroz 1966, 57–68; Petković 2010, 307–8). The fibula is well-preserved, missing only its pin. It is characterised by a special hole for spiral windings, a feature that assigns it to Gencheva subtype 19a (Gencheva 2004, 53–4). Fibulas of this subtype have been recovered from only two other places in Bulgaria (Chitovo, Shumensko district, and Novae, a legionary base on the Danube River). The example from Novae is securely dated to the second half of the third century (Gencheva 2004, 54).

Several other metal objects were found. A decorative belt fitting, in the shape of plant tendrils, once held in place by small iron nails, was found a few centimetres from the fibula. Similar fittings are known from military sites in Rome's western provinces, dated from the second to third century (Oldenstein 1976, 158; see digital figure).[9] A silver plated, peltate bronze mount, probably used as a decoration for a belt, strap, or horse harness was retrieved from Room C. Such peltate mounts are common across the Roman Empire from the mid-second to the early fourth century (Oldenstein 1976, 181; Radman-Livaja 2009, 1501). Other metal objects of note include two appliques (perhaps for horse harnesses) which, like the peltate mount, have parallels from Roman military settlements in the western Roman provinces (Radman-Livaja 2009, 1503).

Most of the other (non-metallic) small finds came from the fill of Rooms B and C. Room B contained fragments of four terracotta lamps, including two distinctive ones. The first, the only complete terracotta lamp recovered, belongs to Loeschcke type VIII and likely dates to the second century (see digital figure, Perlzweig 1961, cat. no. 136–8).[10] The second has shoulders decorated with alternating grape clusters and vine leaves. It resembles Broneer type XXVII, group B, Athenian products following a Corinthian style, dating from the third to mid-fourth century (Perlzweig 1961, 145; Fig. 18.3).

Chronologically, the most important lamp was found during the second year of the project in the thick layer lying above the pavement north of Room C, outside the stone structure. Only the upper part of the lamp with discus is preserved, depicting Athena with helmet and a spear leaning on her right shoulder. It is an Athenian import dated between the mid-third and early fourth century (Perlzweig 1961, cat. no. 653 and 659, see digital figure).[11]

Also recovered was a 6 cm marble head of Asclepius from the fill of Room C (see digital figure).[12] The statue is carefully carved, with distinct eyes, forehead wrinkles, and diadem. Beard and hair are carved using a chisel, with no marks from a hand drill. From below, a small hole is visible in the neck; it might represent an ancient repair, when the head broke off the body. The execution of the sculpture resembles production from the mid-second century, particularly the period encompassing the reigns of Hadrian through Antoninus Pius (Lippold 1963, 208–9; Schröder 2004, 350).

Figure 18.3 Terracotta lamp depicting leaves, grape clusters, and vines (Broneer type XXVII, group B, dating from the third to mid-fourth centuries AD). Scale is in cm.

In addition to the Athenian terracotta lamps noted above, other imported objects were recovered, including type Kapitän II and Dressel 24 transport amphorae (both of Aegean origin: Caravale-Toffolett 1997, 168; Dyczek 2001, 141; 183; Opait-Tsaravopoulos 2011). According to organic residue analyses, both types possibly contained olive oil. The Dressel 24 analysis is, however, inconclusive, pointing also to the possibility of wine and/or milk products (see Polla *et al.* 2015).

Aside from the small finds, architectural elements like marble wall facings, dark red decorated plaster (so-called Pompeian red), and several pieces of window glass were recovered.

18.8 Discussion

18.8.1 Function

The thickness (0.78 m) and height (0.80 m) of the stone walls, combined with the fact that the exterior pavement north of the structure abuts the tops of these walls, suggest that they were underground building foundations. In plan, the foundations represent five adjacent rooms belonging to one large building. During the excavation, the limits of the building on the east and west were not reached (Fig. 18.2). The south-western corner of the building (Room A) is missing.

Despite the fact the interior fill of the westernmost rooms (A, B, C, and E) was completely disrupted by looters, the abundance of tiles suggests that they were roofed, and thus constituted indoor spaces. The pottery found in these rooms was less fragmented than pottery

from the layer covering the pavement in Room D and in the area to the north of the foundation walls. This lower fragmentation of both roof tiles and pottery suggests primary deposition (before looters intervened). Looters appear to have dug through a layer of roof tiles into the room fill, taking only specific items of interest and throwing ordinary pottery, iron nails, and other objects lacking intrinsic value back to their trenches.

The single-phase stone foundations probably supported a superstructure built from perishable materials. A relatively small number of fired bricks, and the presence of wood impressions in mud-bricks, suggest that the house was built using a wooden frame filled with mud-bricks. As these materials are perishable, there was little trace of them.

The surface north of the building, partly covered with the thin pavement of smaller stones and partly with the larger paving stones, likely formed a side street on the exterior of the building. On the east side of the building, in Room D, the small amount of roof tile suggests an unroofed space. The pavement floor, and terracotta water pipe embedded in it, suggest a utilitarian function of this space.

The ground plan of the house resembles the long row houses typical of provincial *vici*, consisting of living quarters in back with workshops or shops and a porch in front, facing a street (Sommer 1998, 45–46; see the reconstruction of the Roman fort and vicus at Ruffenhofen, Germany in Limeseum, www.limeseum.de). In the looted Rooms A, B, and C, we found tableware, cookware, and handmade pottery – assemblages indicative of everyday use. Fragments of several transport amphorae were found in Room A, which might be connected to storerooms located at its rear, next to the river, where a constant temperature might be maintained. To the east, beyond excavations completed to date, there may be commercial space, such as a shop or a workshop facing a street. This arrangement would explain the different character of Room D, with its pavement and terracotta water pipe, which might serve as a corridor that divided living and working areas.

The finds discovered during 2014–2015 excavations, especially the coin of Augustus minted in Ephesus to pay soldiers in Asia Minor, and the metal objects with direct parallels in other Roman military settlements (especially the belt or harness embellishments), support the interpretation of Stroyno-Yurta as a *vicus* of Roman military veterans. The head of Asclepius indicates at least domestic religious activity. The community maintained trade contacts with Aegean Sea, including both manufactured items (terracotta lamps) and commodities (olive oil and wine). The marble wall facing and window plates may suggest the presence of at least some elite inhabitants.

18.8.2 Abandonment and levelling

In the undisturbed zone north of the building and in Room D, the 0.40–0.50 m layer with mixed fill is likely debris from the building's destruction. Pottery finds support this interpretation; fragments of a single vessel were separated vertically by 25 cm in the fill, while sherds of another vessel were found some 15 m apart in different trenches (one fragment to the north of the foundation wall outside the house, and one in Room D). These fragments also have ancient breaks, perhaps relating to the levelling of this area in antiquity. Prior to looting, the same layer likely covered Rooms A, B, C, and E.

It has not been established to date why the building was razed. Perhaps it has something to do with the missing south-western corner of the house, dangerously close to the Dereorman River. In several places, on the both sides of the riverbed, stones and architectural ceramics could be seen. The river cut through the edge of the house at some point in the past, washing away parts of its architecture. Perhaps it did so in antiquity, severely damaging the building and leading to its partial collapse. The area could then have been judged unsuitable for habitation, levelled, and abandoned, while the settlement as a whole continued.

18.8.3 Chronology

Previous excavations, as well as isolated finds from the site, indicated that Stroyno-Yurta was occupied sometime between the latter half of the first and the fourth centuries AD (Dimitrova and Popov 1978, 26; Dimitrov 2004, 221; Bakardzhiev 2007; 2008; 2012, 365; Boyanov 2007, 70). Roman graves excavated in the surrounding villages of Stroyno, Boyanovo, and Borisovo dated to the same period. Most finds from the SAP excavations, however, support a narrower lifespan, from the mid-second century through the turn of the third and fourth centuries.

Two events related to the settlement of Roman veterans at this time in the Tundzha River catchment appear relevant. Around the year AD 70, during the reign of Emperor Vespasian, veterans of Legio VIII Augusta founded the colonia Flavia Pacis Deultensium (Deultum) at the modern village of Debelt near the Black Sea (Karayotov 2012, 93). In AD 135–136, a military garrison for *Cohors II Lucensium* was established at the site of Kabyle (some 40 km north of Stroyno-Yurta). This foundation attracted many craftsmen as well as military veterans (Boyanov 2006; 2007). Deultum represents a parallel (perhaps contemporary) foundation, while the establishment of the Kabyle garrison provides a local source of veterans in need of settlement. Together, these dates could roughly bracket the foundation of Stroyno-Yurta.

Despite some evidence for an earlier date, we propose that the foundation of Stroyno-Yurta is related to the garrisoning of Kabyle in the second century. Only two objects from Stroyno date to the first century AD: a type 1 Roman-Doric capital (Bakardzhiev 2007, 238; 2012, 365) and a Dressel type 43 transport amphora handle (Bakardzhiev 2007, 240). The type 1 Roman-Doric capital is often associated with the early Roman period in Bulgaria, however, it might also have been reused within a later construction. Such reuse is known from Diocletianopolis (modern Hisarya), where a capital was

found in a context dated to the second–third century AD (Dimitrov 2004, 222). Likewise, Dressel type 43 amphorae frequently date to the first century AD, but can occur from the early first to the early third century (*cf.* Opait 1980, 301; Markoulaki, Empereur, and Marangou 1989, 579; Empereur, Kritas, and Marangou 1991, 493; Bjelajac 1996, 39–40). Finally, the Roman graves excavated near Stroyno, Borisovo, and Boyanovo might be connected to other Roman settlements in the vicinity that have not yet been investigated. Based on the 2014–2015 excavations, as well as reconsideration of the material previously discovered at the site, no objects confirming a first-century date have been recovered.

This suggests that the foundation of Stroyno-Yurta was associated with the stationing of *Cohors II Lucensium* at Kabyle in the AD 130s. Both settlements lay along the Tundzha River and associated Trajanic road, establishing a more direct transport link between Stroyno-Yurta and Kabyle than between Stroyno-Yurta and Deultum, which lies some 60 km distant on the Black Sea coast. Boyanov (2008, 214), furthermore, relates the sites based on two inscriptions, one from Kabyle and one from Stroyno-Yurta, both of which included the name Avilius. Regarding dated artefacts from the site itself, the *terminus post quem* for the building of the house is later (AD 218), based on the coin of Diadumenian recovered from its foundation trench. Other finds, however, including the bronze military diploma (AD 152–158), the Loeschcke type VIII terracotta lamp, and the marble head of Asclepius argue for an earlier, mid-second century, foundation of Stroyno-Yurta.

It is even more difficult to securely date the abandonment of Stroyno-Yurta or to determine its cause. As noted above, the house was built sometime after AD 218, and the stone foundations have only a single construction phase. The thick levelling layer sealing the house foundations contains mixed materials, but some of the artefacts can be more precisely dated. The silver *antoninianus* of Emperor Gallienus (AD 253–260) and the Athenian terracotta lamp (mid-third to late fourth century) argue for the abandonment of Stroyno-Yurta sometime after the mid-third century. This date would be contemporary with Gothic raids in central Thrace during the third century Roman crisis, when many habitations were reportedly destroyed (Haynes 2011, 8). Excavations, however, produced no evidence for violent destruction of the site, such as burning or the presence of arrowheads or other projectiles; damage from the Dereorman River seems a more likely explanation for the abandonment of the house. Levelling also appears to have been deliberate, implying that someone remained at the site to undertake this activity. Thus, it seems that the house was not only constructed a century after Stroyno-Yurta was founded, but also that it was abandoned before the rest of the settlement, although how long before remains uncertain.

18.8.4 The impact of looting

Looting constitutes a major problem for the site of Stroyno-Yurta. The illicit trenches, ranging from ca. 1×1 m to 12×2.5 m and reaching a depth of ca. 1.5 m, can be found over the entire overgrown area of the site – and new ones keep appearing. Fresh trenches (12×2.5 m and 4.5×1.5 m) were documented in 2014 on the northeastern border of the settlement between the overgrown area and the cultivated fields. The area we excavated during our first season had also been disrupted by looters by the time we returned a year later (they had dug a 2.5×2.5×1.5 m trench directly north of the area we had excavated).

Based on surface observations and excavations, looters used metal detectors to identify the location of metal finds like coins (which presumably have some value on the black market). Whilst digging them out, they look for stone architecture. If they hit a wall, they look for a corner. They identify the interior of the structure and excavate it down to the foundations. In this way they gain all the finds from the most productive areas – the interior of the building, as in the case of Rooms A, B, C, and E.

Any attempt to quantify looting at the site based on robber's trenches visible on the surface would be inadequate here. During the first week of excavation, areas which did not initially show any disruption contained reverse stratigraphy because of illicit excavation. Looting has gone on for so long, and has been so pervasive, that old and new robber's trenches overlap. After the old trenches are filled with the soil from the newer ones, the similarity of soil, the passage of time, compaction, erosion, and vigorous vegetation growth make the surface look uniform. Robber's trenches in the scrubby area visible in high-resolution, multi-spectral satellite imagery covered 10% of the surface in 2009.[13] This percentage represents the minimum disturbance of the site, and almost certainly underestimates its extent. The actual destruction is hard to assess; observations during the 2014 excavation of 100 sq m suggest that disturbance exceeds 50%.

Although much of the site is disturbed, zones with preserved stratigraphy still exist. The stone architecture is also relatively intact. Exploration of the less disturbed areas still has much to tell us about the nature of the site.

18.9 Conclusion

The excavations conducted at Stroyno-Yurta during 2014–2015 uncovered stone foundations of a five- room house including a shop or workshop. Artefacts recovered from these excavations refined the chronology of Stroyno-Yurta. The house itself was constructed after AD 218 and levelled between the second half of the third and the early fourth century. The lifespan of the settlement at Stroyno-Yurta is longer, with a likely foundation date in the mid-second century and abandonment at an unknown date sometime after the levelling of the house. The TRAP

investigations support the interpretation of Stroyno-Yurta as a *vicus* for Roman veterans.

Notes

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2 TRAP Digital Archive DOI:https://doi.org/10.6078/M7Z60M4C

3 Yambol inscriptions catalogue DOI: https://doi.org/10.6078/M7SQ8XG7

4 We thankfully acknowledge all of the participating students (in alphabetical order): Tomáš Chlup, Viktoria Čisťakova, Věra Doležálková, Robert Frecer, Petra Janouchová, Markéta Kobierská, Johana Tlustá, Michaela Smiejová, Hana Šofková, Jakub Havlík, and Veronika Ženíšková. Many thanks also belong to Miroslav Kozarev, Todor Vulchev, and Yavor Rusev of the Yambol History Museum for their help during project preparations and excavations.

5 The coins were identified and described by Dr Evgeni Paunov, Cardiff University, in 2014, and re-evaluated by Petra Janouchová, Institute of Greek and Latin Studies, Charles University, Prague, in 2015. Metal finds are being processed by Viktoria Čisťakova and terracotta lamps by Robert Frecer, both of whom are doctoral students at the Institute of Classical Archaeology, Charles University, Prague. Their preliminary conclusions are used in this summary. We are very grateful to these researchers for their help with identifying and describing these objects.

6 see digital figure DOI:https://doi.org/10.6078/M7PV6HFH

7 see digital figure DOI:https://doi.org/10.6078/M7K35RRJ

8 see digital figure DOI:https://doi.org/10.6078/M7FB511M

9 see digital figure DOI:https://doi.org/10.6078/M79K489W

10 see digital figure DOI:https://doi.org/10.6078/M75T3HJQ

11 see digital figure DOI:https://doi.org/10.6078/M7222RT9

12 see digital figure DOI:https://doi.org/10.6078/M7X928CV

13 Quantification is based upon 1 m resolution DigitalGlobe satellite imagery acquired by the TRAP project in 2009.

19

Excavations at Dodoparon, Yambol province

Adela Sobotkova, Catherine Longford, and Stefan Bakardzhiev

Abstract *Excavations during autumn of 2010 at the fortified hilltop settlement of Dodoparon complemented the Tundzha Regional Archaeology Project (TRAP) survey campaign in the Yambol province. Three trenches provided information about the third to sixth century AD at this regional centre. Thick fortification walls enclosing 4 ha revealed the defensive character of the site, while the presence of slag indicated metal processing. A depot of 55 vessels found inside a small, centrally located structure attest to the storage of consumption-ready foodstuffs. A variety of metal finds, including a coin hoard hidden in the storage structure, implied a rushed abandonment of the site at the end of the sixth century AD, consistent with historical records of settlement evolution in the Middle Tundzha River catchment. Archaeobotanical results from the site provided evidence for agriculture and diet in the Roman period, identifying cereal grains, legumes, fodder, and weeds. Of interest was the preponderance of millet, which corroborates written evidence concerning the typical diet in ancient Thrace, and is consistent with stable isotope analysis of skeletal remains from Boyanovo presented in Chapter 17.*

Keywords *excavation; Roman Thrace; Late Antiquity; fortification; metallurgy; paleodiet; archaeobotany*

19.1 Introduction

Tundzha Regional Archaeology Project (TRAP) activities in the Yambol region were expanded in the autumn of 2010 to include excavations at the site of Dodoparon, situated within the survey area near the village of Golyam Manastir (Fig. 11.1). Visible fortifications and pottery in robbers' trenches revealed the existence of this difficult-to-access hilltop fort, while previously known inscriptions found nearby and dated to the Roman period provided the name 'Dodoparon' for the site (or 'Dadopara' as in SEG 42:651). Although only Roman materials were initially visible, earlier activity at the site was suspected based on analogues in the eastern Rhodopes that have been identified as Thracian hilltop sanctuaries (on rather tenuous evidence).

The goals of TRAP excavations at Dodoparon included: (1) verifying the age and function of the site, and (2) integrating a first-tier site (analogous to Seuthopolis in the Kazanlak region) into our investigation of cultural landscapes in the Yambol region. In particular, we hoped to assess the putative Early Iron Age origins and the ritual character the site through test excavations.

Stefan Bakardzhiev from the Yambol History Museum directed excavations, supported by Adela Sobotkova. In addition to Yambol History Museum personnel (Ilija Iliev, Georgi Iliev, and Yavor Rusev), a dozen local workers and TRAP volunteers participated in the excavations and documentation (see Participant list in the front matter). In addition to the Australian Research Council funds that supported the overall TRAP project, excavations and related analyses at Dodoparon were funded by an International Collaborative Archaeological and Bioarchaeological Studies (ICABS) grant (10ICAB4) from the America for Bulgaria Foundation (ABF), administered by the American Research Centre in Sofia (ARCS).

Fieldwork at Dodoparon began in September 2010 with creation of an access route, site clearance, and mapping of surface remains. Limited, trial excavations were then conducted over five weeks, from 6 October to 17 November 2010, with occasional stoppages imposed by heavy rainfall. Processing and analysis of artefact and archaeobotanical remains began during excavations, and continued through a three-week study period from 18 November to 5 December 2010. Trenches were mapped

by surveyors and backfilled at the end of the season. Diagnostic finds were conserved and placed in storage at the Yambol History Museum.

A Bulgarian report on the excavations was published in the *Annual Reports of the Archaeological Institute* (*Arheologicheskite Otkritia i Razkopki*) the following March (Bakardzhiev 2011). Bakardzhiev is preparing the metals for publication, while Petra Tušlová is writing an article discussing the pottery assemblage in more detail.

19.1.1 Dodoparon physical setting and archaeological context

Dodoparon occupies a prominent peak above the Tundzha River plain, ca. 40 km southwest of Yambol as the crow flies (Fig. 19.1, see also Fig. 1.3). The peak is locally referred to as Gradishteto or Kaleto. At 600 masl it rises some 400 m above the surrounding plain, dominating the Manastirski Vazvishenniya (*cf.* Chapter 11).

The presence of a site atop Gradishteto is obscured by dense scrub oak forest, which also hinders access. Ancient, collapsed walls look like overgrown embankments that, when excavated, contain stones and other building materials. Stretches of these embankments can be traced around the top of the hill running almost level between the 560 and 570 masl contour lines. The walls enclose an elongated area of ca. 500 m by 80 m covering ca. 4 ha. On the exterior of the fortifications the terrain drops away steeply, while on the interior the ground rises more gently. Robber's trenches in the centre of the site reveal stone structures and rooms with walls preserved to ca. 1 m in height. Otherwise, a dense cover of vegetation and leaf litter obscures most remains.

The existence of an ancient site at Gradishteto was suspected on the basis of three inscriptions, two discovered among the ruins on the hill and another ploughed from a field on the south side of the village of Golyam Manastir in 1883 (*IG Bulg* 3.2, nos. 1794, 1795, and 1796). These inscriptions bear Greek language dedications to the God Apollo (Jireček 1888, 515). All three have been dated to the second or third century AD based on letter forms and personal names (Mihailov 1964, 254). The one from near Golyam Manastir declares that it accompanied a sculpture dedicated to 'beautiful Phoebus' in the 'land of Dodoparon' (*IG Bulg* 3.2, 1794). The dedications to Apollo found in all three inscriptions suggest that a sanctuary to Apollo and an associated settlement were situated nearby. The lack of other major archaeological sites in the vicinity has prompted the identification of Gradishteto with the ancient site of Dodoparon. It remains unclear whether a sanctuary was located there since no archaeological evidence for one has yet been found either within the walls of the settlement or elsewhere on the hill (noting that investigations to date have been limited in extent). The connection in the inscriptions between a Roman period sanctuary of Apollo and the place name Dodoparon has led some researchers to place a sanctuary of Apollo at the site (Mihailov 1964, 175–8; Velkov 1991, 26; Janouchová 2016).

The epigraphic evidence for a sanctuary in the Roman era, visible remains on a prominent peak, and finds of Hellenistic coins of Kabyle at the site have also inspired speculation about a sanctuary at Dodoparon in earlier times, during the Thracian (Iron Age) period (Draganov 1998). Dodoparon, with a 4 ha enclosed area situated at ca. 600 masl, resembles hilltop sites in the eastern Rhodopes that have been interpreted as Early Iron Age ritual centres (Delev 1982a; 1982b; Domaradzki 1986; Damyanov 2011). Perperikon and Tatul are the best known of these 'Thracian hilltop sanctuaries' (Ovcharov 2005; Ovcharov *et al.* 2005; 2008). Investigations at these analogous sites have been hindered by the lack of stratified material and the burial or destruction of ancient remains by Mediaeval construction. Rushed excavation and the pursuit of politico-cultural objectives have also reduced the credibility of ongoing research at Perperikon and Tatul, where scientific inquiry has often been subordinated to a program of investigation aimed at establishing their Thracian heritage, conveyed to the public through aggressive media campaigns (Stanilov 2006). Our intent was to subject Dodoparon to a more disinterested research program and assess whether the archaeological evidence would affirm pre-Roman habitation, particularly the existence of a 'Thracian hilltop sanctuary'.

19.1.2 Research agenda

The immediate goals of research for Dodoparon included determining the site's chronology and function, and improving the understanding of this large settlement in its broader context (supported by TRAP survey of its environs). The area enclosed by the walls of Dodoparon

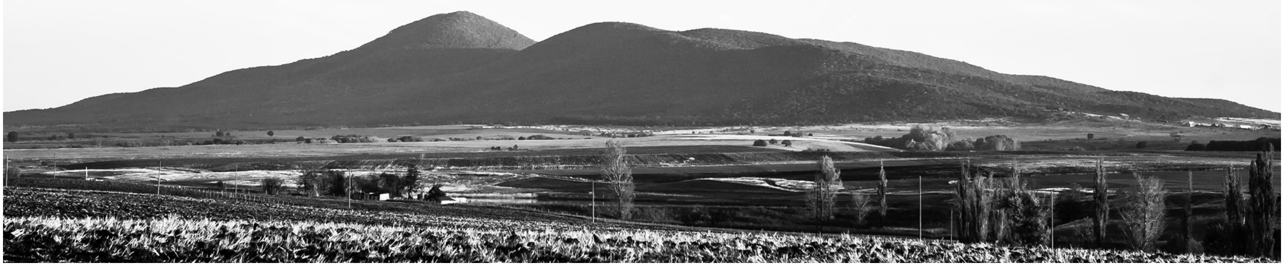

Figure 19.1 Photo of Manastirski Vazvishenniya from northwest. Gradishteto Hill is the highest peak (on the left). Dodoparon sits on the summit.

is comparable to Seuthopolis, Kabyle, or Sboryanovo (Dimitrov and Čičikova 1978; Ivanov 1982; Stoyanov *et al.* 2006), placing Dodoparon amongst known first-tier Hellenistic and Roman regional centres. Its good preservation allows evaluation of the site in a way that is impossible with, for instance, Seuthopolis, which was inundated in the 1950s by the construction of the Koprinka Reservoir. TRAP survey in both Yambol and Kazanlak provided regional context by emphasising smaller, second and third tier sites, off-site activity areas, and the spaces between these sites. Excavations at Dodoparon allowed integration of a first-tier hilltop settlement into the wider picture of habitation. It also offered a useful contrast to Kabyle and Seuthopolis, both lowland, riverside sites.

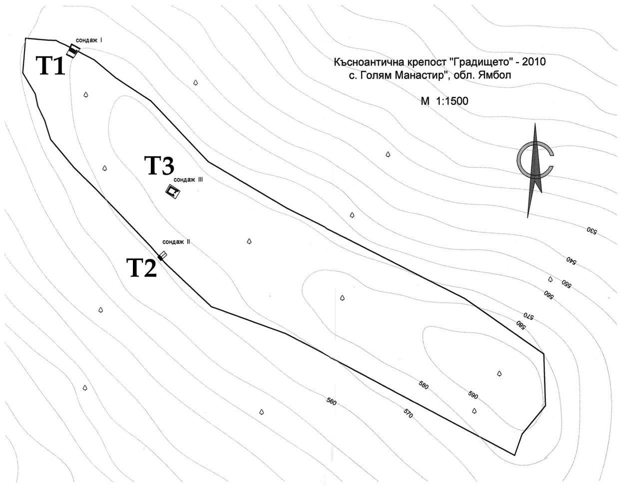

Figure 19.2 Plan of the Dodoparon fortifications with the location of the three trenches excavated during 2010.

19.2 Methods

19.2.1 Preparatory activities

The first two weeks of fieldwork were dedicated to clearing vegetation, as the entire hill of Gradishteto was inaccessible due to dense scrub oak forest. Under the supervision of forestry personnel, a narrow pedestrian path was cleared from the village of Golyam Manastir to the hilltop. Later, a 600 m dirt road was cut with a bulldozer along a disused military access route, allowing access by four-wheel drive vehicles. Three areas were cleared on the hilltop to accommodate planned trenches (see below).

Clearance was, however, limited by its scale, cost, and objections from forestry personnel. Dense vegetation, and the substantial root systems supporting it, also prevented any geophysical remote sensing, and there was no way the entire walled area could be cleared.

19.2.1 Excavation and processing

Three trenches were excavated in 2010, two spanning the visible remains of fortification walls, and one within the walls (Fig. 19.2). Trench 1 (T1) focused on a northwest section of fortress wall. Measured from the exterior edge of the wall, visible on surface, the trench covered 7×7 m towards the interior (including the wall itself) and 3×7 m outside the wall. Trench 2 (T2) investigated a southwest section of the wall, measuring 5×5 m inside and 5×5 m outside the wall. Trench 3 (T3), measuring 8×12 m, was placed into an elevated platform in the middle of the fortress. Preparation for these trenches required the removal of stones and vegetation (including some large trees).

Excavation was conducted in arbitrary spits or in stratigraphic contexts where archaeological features or differences in soil matrices emerged. Levels were recorded with a transit. All soil from the trenches was quantified and sieved. Architectural ceramics were sorted (by chronology and type), weighed, counted, and left on site. Pottery and other artefacts were taken to our base (a municipal building in Golyam Manastir), washed, and bulk processed daily, allowing for immediate feedback about the function and chronology of the material. Excavators also collected five litres of soil from each context or spit prior to sieving for archaeobotanical floatation.

At the end of excavations, trenches were mapped with a Total Station by a geodetic team from Yambol, producing a site plan. Trenches were then covered with nylon cloth and backfilled. Artefact analyses were completed during a three-week, post-excavation study period. Inventoried pottery was placed in storage at the Yambol History Museum. Floatation of soil samples was also completed after the conclusion of excavations, with residues later processed at the University of Sheffield (see below). Animal bones were the only samples that were not processed during the season, but instead documented and stored for later analysis.

Recording was done in English and Bulgarian, with all records translated so that documentation was complete in both languages. Records were digitised daily (structured data into Excel spreadsheets and field notes into Word documents). Digital excavation photographs were downloaded and labelled each day. Artefact photography was completed as part of post-excavation analysis.

19.2.3 Archaeobotany

All soil samples from the excavation were processed at the base Golyam Manastir using a water separation machine to retrieve charred remains. Floatation used a Siraf-type machine (French 1971) inherited from the German-Bulgarian joint project at Drama (conducted in 1980–1990s) and refurbished. Two-millimetre synthetic window screen mesh was used to collect the heavy fraction of the soil sample that sank during processing, while four ply medical gauze was used to catch the floated material. Soil samples averaged approximately 4.7 litres in volume per archaeological context, and a total of 128 litres of soil was processed. The floated material was air dried and transported to the Archaeology Department at the University of Sheffield, UK. Charred remains were sorted

from the heavy fraction in the field without the use of a microscope and taken to Sheffield.

In the laboratory, all floated material was sieved into >4 mm, >1 mm, and >0.3 mm fractions to make identification easier. Of the 27 samples taken, 18 were selected for archaeobotanical analysis on the basis of context and depth. All samples analysed, except for T2 A1 40–60 and T2 A1 80–100 Pit 2 were examined in their entirety. Samples T2 A1 40–60 and T2 A1 80–100 Pit 2 were halved by means of a riffle splitter. The material was examined using a Kyowa microscope with up to 42× magnification. Wood charcoal was present in all samples, but none contained more than 50 pieces which were greater than 2 mm in size, so charcoal analysis was not attempted. Only charred seeds and fruits were sorted from the floatation samples. Seed identification was made with reference to the seed comparative collection housed in the Department of Archaeology at the University of Sheffield and to seed atlases by Cappers, Bekker, and Jans (2006) and Musil (1963).

19.3 Results

19.3.1 Excavations

After six weeks of excavation, two stretches of fortification wall were exposed to bedrock. In the northwest trench (T1), the fortification consisted of two drywall faces of large (0.50–60 m per side), rough-hewn, gabbro fieldstones, infilled with rubble (see digital plan and photo).[1] The wall's preserved height in T1 was 1.5–2.1 m, and its maximum preserved width 2.9 m. Bedrock was reached at 0.50 m beneath the modern surface inside the wall and 1.5 m outside. Several sherds of Early Iron Age pottery were discovered lodged in the wall fill (Pshenichevo type stamped ware) and dispersed in the topsoil, but no undisturbed Early Iron Age materials appeared in the deposits surrounding the wall. On the interior of the wall, the 0.20 m of undisturbed soil laying atop bedrock contained pottery dated from the third to fourth century AD. Above this layer, there was a mixed humic sediment with mostly modern materials and a few third to sixth century artefacts. On the exterior, sediment contained humic soil but no cultural materials. These humic topsoil layers arose from litter decomposition and mechanical and chemical mixing after the abandonment of the site.

The southwest trench (T2) revealed a 4.5 m long stretch of wall 3 m high and 2.1 m wide, with fieldstone, rubble, and mortar faces (Fig. 19.3, and digital plan).[2] Two construction stages could be discerned: the lowest three courses were of drystone construction (larger rough-hewn blocks infilled with smaller stones similar to the wall in T1), while the courses above were composed of smaller blocks bonded with white mortar containing red ceramic inclusions (perhaps representing a later phase of construction).

Inside the wall in T2, the sediment was nearly 2 m deep (see digital photos).[3] The top 0.60 m presented a

Figure 19.3 An oblique photograph of the exterior wall face in T2; showing the wall in archaeological context.

mixture of humic sediment, modern material, and artefacts spanning from the third to sixth century. Below the topsoil, three distinct layers were recognised. The upper deposit contained a mixture of highly fragmented fifth to sixth century ceramics and bits of metal. The middle deposit contained pottery dating to the fourth century, and a few handmade but nondescript pot sherds. Within the middle deposit, two patches of darker soil with charcoal inclusions appeared. Their contents were sieved and processed as separate contexts (Pits 1 and 2), but they ultimately produced no material that would differentiate them from the overall deposit. The lowest deposit in T2 was only partially excavated. It contained pottery from the third and fourth centuries AD and a bronze coin with a contramark dated to the third century. Outside the wall, the trench contained broken rock which may have been produced during construction, and wheel-made, indeterminate sherds dispersed in a uniform humic matrix of decomposed leaf litter. Sterile soil was not reached on the exterior of T2 before excavation ceased at a depth of 2.0 m. No other structures were found in this trench, either inside or outside the wall. While most material was not associated with any specific feature, its density and diversity, especially in the mixed zone near the surface inside the wall, was remarkable. Pottery and architectural remains were interspersed with animal bone and metal. Several large pieces and many small fragments of slag indicate metal processing. The soil at the interior base of the wall, which could have provided a *terminus post quem*, yielded no materials, while the deposit outside the wall produced a uniform collection of nondescript (but wheel-made) pottery across its entire depth.

The central trench (T3) revealed the stone foundations of a late Antique structure in a shallow (0.5 m) deposit immediately above bedrock (Fig. 19.4). The foundations measured some 8×6 m (maximum), comprising a single room with an *in antis* entry facing southeast. The walls were ca. 0.9–1 m thick, built from small (10–25 cm) to

Figure 19.4 Photo of the floor in central trench T3, looking southeast.

medium-sized (30–40 cm) fieldstones, infilled with soil. Much of the trench contained fragments of ceramic pan and cover tiles and burnt fragments of mudbrick. On this evidence, Bakardzhiev (2011, 370) concludes that the stone foundation supported mudbrick walls above.

Small metal finds were abundant in this deposit. Nails, brackets, furniture attachments, jewellery (belt buckles; pendants), and various fragments of domestic implements were accompanied by arrowheads, projectiles, and fragments of weaponry. A single hoard containing nine coins of Justinian and Justin II date the deposit to the sixth century (536–572).

Among the remains in T3 there were ca. 30 kg of pottery, which were reconstructed into some 55 complete vessels (Tušlová 2017). Half of the fragments were severely burnt after breakage. Storage, kitchen, and tableware were present. The storage wares included six *dolia* (storage pots), seven transport amphorae (see Figs. 19.5 and 19.6), two small amphorae of Kuzmanov type XIV sub-variant I, and five Late Roman Amphora 2 (one with a lid). The Kuzmanov XIV sub-variant I amphorae were likely made in Dobrudja, Romania (Kuzmanov 1985), and residue analysis indicates that both vessels contained olive oil. One Late Roman Amphora 2 also yielded traces of oil, while the other yielded both oil and lactic acid, indicating that at one time it contained either a dairy product or wine (*cf.* Polla *et al.* 2015).

Kitchenware included three cookpots, one strainer, and one pot with a spout. Tableware was the most numerous, representing at least 37 vessels, primarily bowls, water jugs, and serving pots. Most of the tableware appears to

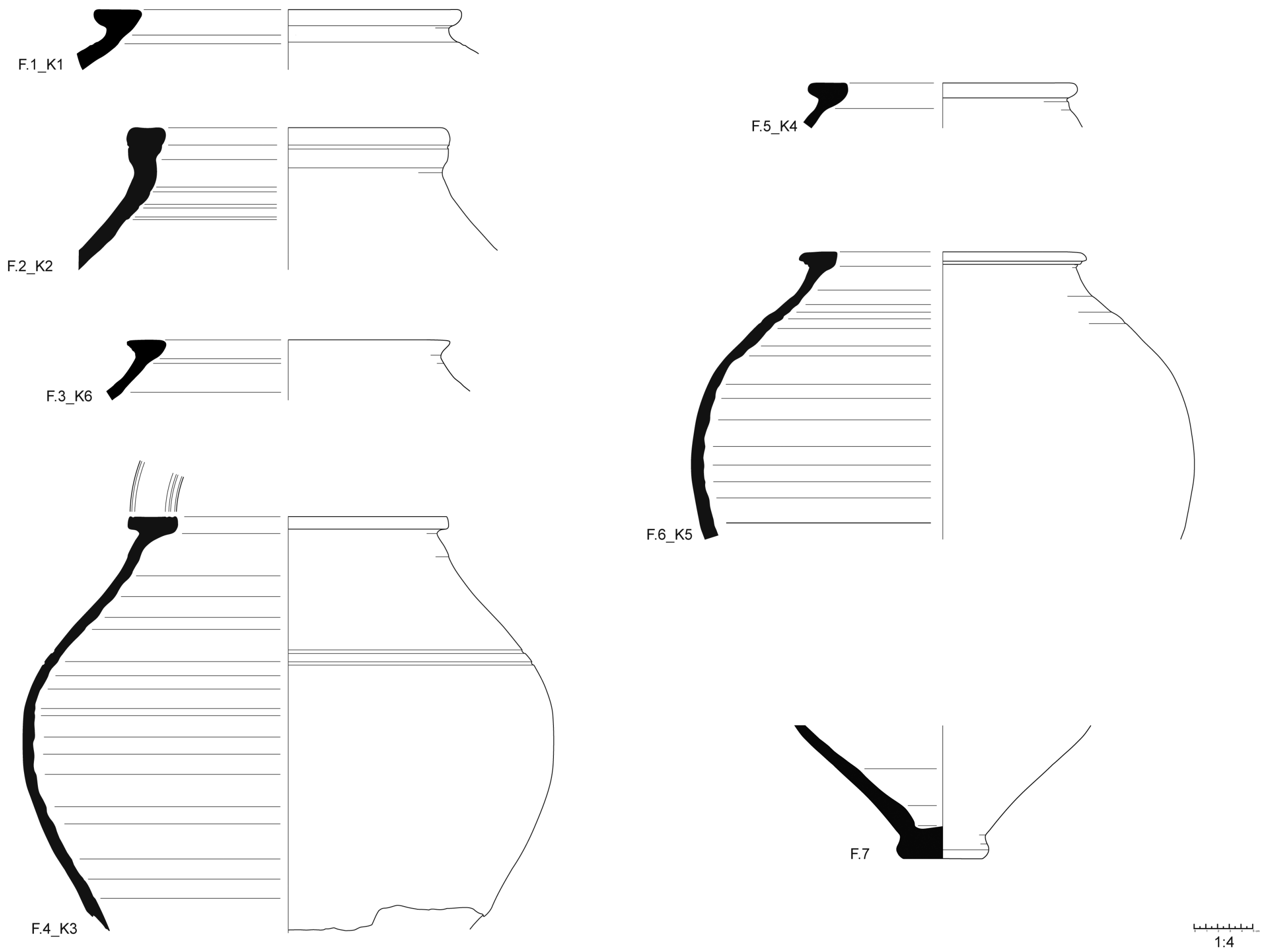

Figure 19.5 Profiles of the dolia *from central structure at Dodoparon (after Tušlová 2016).*

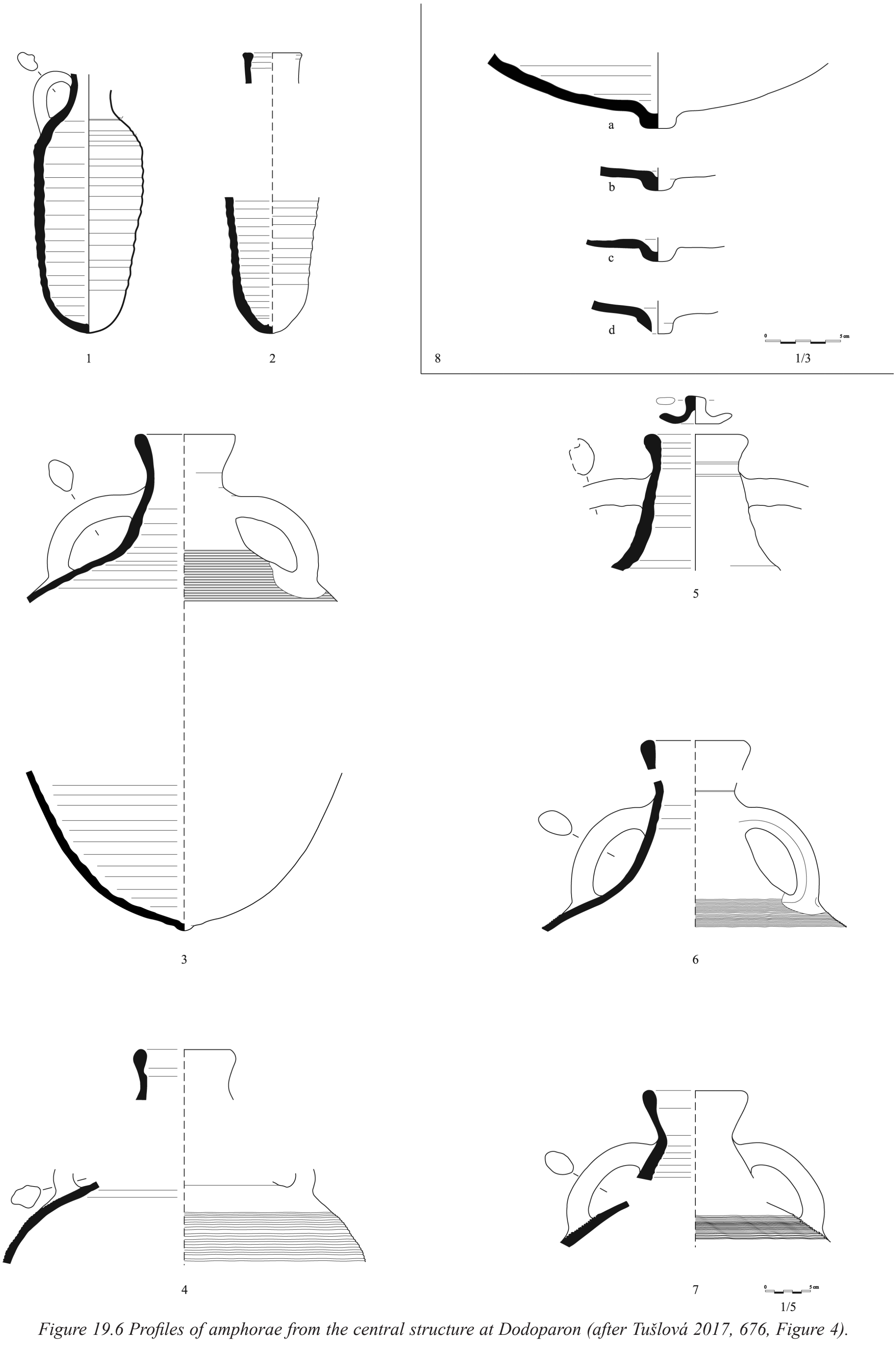

Figure 19.6 Profiles of amphorae from the central structure at Dodoparon (after Tušlová 2017, 676, Figure 4).

be local production. Only a single vessel was imported from the Eastern Aegean, a Phocaean Red Slip bowl of late Hayes type 10/6a (alias Late Roman C ware; Hayes 2005, 88). Cookpots and some tableware were decorated by as many as three straight or wavy, parallel, incised lines; other types of decoration are absent from the locally made tableware (Tušlová personal communication 3 September 2015).

19.3.2 Archaeobotany

Twenty-seven soil samples were collected during excavations at Dodoparon for archaeobotanical analysis. Of these, 11 samples were from trench T1, 14 samples from T2, and two from T3.

Preliminary results from the charred seed analysis of the Dodoparon samples are provided in digital format.[4] The full range of the European crop assemblage was present, including four different types of wheat: emmer (*Triticum dicoccum*), einkorn (*Triticum monococcum*), free-threshing bread or durum wheat (*Triticum aestivum/durum*), and some possible spelt (*Triticum spelta*). Other cereals found include hulled barley (*Hordeum vulgare*), broomcorn millet (*Panicum miliaceum*), and rye (*Secale cereale*). Well-preserved pulses included broad bean (*Vicia fava*), lentil (*Lens culinaris*), chickpea (*Cicer arietinum*), common pea (*Pisum sativum*), grass pea (*Lathyrus sativa*), and bitter vetch (*Vicia ervilia*). Charred wild and weedy seeds were found in most samples with *Galium* sp. (bedstraw) being the most common wild seed identified. All samples contained modern roots, twigs, and seeds. Crop seeds from T3 are presented in digital figures.[5]

Millet was the most ubiquitous cultivated crop, found in 13 samples, including all samples from T2 and T3 and in the deepest sample from T1. Free-threshing wheat was also common and represented the dominant wheat type, being found in all T2 samples except the deepest, all T3 samples, and the deepest sample from T1. Hulled barley was present in the lower levels of T2 and T3 and, rarely, T1. From the proportion of symmetric to asymmetric grains found in T3, it appears that hulled, six-row barley was present in the structure. Most rye was identified in the T3 building. Rare grains of einkorn and emmer were present in T2 and T3. No cereal chaff was found in any of the samples, possibly indicating that processing occurred elsewhere.

Lentil was the prevalent pulse species, present in 10 of the samples from the lower levels of T2, T3, and the deepest T1 sample. Bitter vetch was the next most common pulse, present in T2 and in large quantities in T3. Grass pea was occasionally found in T2, and a few seeds were identified in T3. One chickpea was found in the deepest level of T2, and 12 broad beans were present in T3.

Very few charred archaeobotanical remains were found in wall trench T1, and those collected resembled material from the other wall trench (T2). Occasional charred seeds were present in the soil in the upper layers of T1, but most of these samples consisted of modern seeds and roots that may represent the accumulation of natural soil following site abandonment. Of the few charred remains found in T1, most were found in the deepest sample at 80–90 cm and are similar to the assemblages found in the soil of T2, having a limited mixture of charred cereals and pulses with an occasional weed seed. Overall, the material of T2 is relatively uniform, both in species variation and seed proportions. There is no significant difference between the material from Pits 1 and 2 and the rest of T2. Since most soil samples were small, variation in sample composition may be the result of differences in sample volumes rather than actual species variation. The plant remains from T1 and T2 do not appear to represent *in situ* material but were probably incidental inclusions of charred seeds in the backfill of negative features.

In T3, the sixth century structure, two soil samples were taken, one from each side of the room, labelled A and B, although their location within the building was not recorded. Both samples were very rich in cereal and pulse seeds, which suggests that crops were stored in the building. Sample T3-A was dominated by free-threshing wheat; over 40% of the charred remains were identified as bread or durum wheat, and it is likely that most of the indeterminate wheat was also fragmented free-threshing wheat. The next most abundant component of the assemblage was bitter vetch, which constitutes 16% of the sample, some of which showed signs of insect damage. This indicates that the bitter vetch seeds had been stored for a period prior to the fire in the building. Sample T3-A also contained 50 rye seeds and 12 broad beans. Several wild and weedy species were also found in this sample. As yet, full identification of weed species has not been completed, so environmental indicators and crop growing conditions have not been determined. The second sample, T3-B, taken from the other side of the room, appears to differ considerably from sample T3-A. Sample T3-B was rich in millet rather than free-threshing wheat and contained very few rye grains and no broad beans. These differences indicate that different crops were stored in different parts of the room.

19.3.3 Challenges of 2010 season and prospects for future research

Several difficulties challenged TRAP's 2010 investigation of Dodoparon. Excavation challenges included the timeframe and logistics. The project was delayed by about one month due to lengthy administrative processing of the funding. The delay kept a paid workforce idle at the start of the project and left a labour shortage towards the end of fieldwork. A lack of trained surveyors occasionally resulted in inconsistent elevations, which were later corrected by measurements of the profile. Fieldwork was also logistically challenging because of the difficult access to the site. The lack of open space made on-site

processing of finds difficult, and even movement around the site was complicated by the dense vegetation. After rains, vehicle access was impossible until the dirt road to the hilltop dried. Vegetation prevented geophysical survey within the settlement, a problem compounded by steep slopes outside the walls.

Perhaps the greatest setback, which offers lessons for other projects, was the theft of portable computers from the base near the end of the project. Although the Yambol police eventually retrieved the stolen computers, they had all been reformatted and the data could not be recovered. The lost data included much documentation, especially weight and count of artefacts by type for each context. Unfortunately, bulk artefacts had already been merged by type, so variations from context to context could not be reconstructed, and the quantified study of bulk artefacts planned and partially completed by Yambol History Museum staff was ruined. The effort devoted to detailed contextual excavation and recording was undone; the loss of contextual data hampered analysis of the spatial organisation of T3 structure contents, and has made a more detailed assessment of the site's decline impossible. Project volunteers also lost much personal and professional data. TRAP leadership had established a server and a high speed local area network for backups (neither of which were touched during the theft), and required such backups in the project's daily procedures. Museum staff and project volunteers, however, did not regularly copy their files to the the server. The lesson from this tragedy is that, in addition to taking routine security precautions (none of the physically locked or password-protected laptops were stolen), all backups must be not only required by policy but also automated to the extent possible and audited on a regular basis.

Further excavations at Dodoparon are needed to determine the extent of occupation before the Late Roman period (especially considering the Early Iron Age sherds, Hellenistic coins, and second-century AD inscriptions). It will be necessary to examine the site's full range of functions, determine the chronology of its evolution in the Roman period, and clarify the circumstances of its abandonment. The site has been prepared for efficient resumption of excavations. Trenches were covered with nylon cloth and backfilled. Yambol History Museum staff are monitoring the trenches' status on a regular basis, as well as that of the exposed fortification wall, checking for any damage from erosion or looting. Both TRAP and the Yambol History Museum are seeking additional resources for more extensive excavations at Dodoparon and at related sites in the Yambol district, including the extension of excavations at the veteran's settlements of Stroyno described in Chapter 18. Should work resume at Dodoparon, provisional plans involve excavating a series of smaller test trenches across the shallow soil of the hilltop to sample as much of the site as possible, followed by more extensive excavation of areas that contain material shedding light on the questions raised above. Further landscape investigations in Dodoparon's vicinity would also help to contextualise the site. Overall, the preliminary excavations described here have laid the groundwork for future research at Dodoparon, clarifying in broad outlines the function and chronology of the site during the Late Roman period, and confirming that it is one of the best preserved Late Roman hilltop sites in Bulgaria.

Beyond understanding the site itself, additional, coordinated excavation of Dodoparon and survey of its environs would help us understand evolving rural landscapes in the Middle Tundzha River catchment during the Roman period. Such research would illuminate subsistence strategies, economic activities, and trade. The many Roman and post-Roman rural sites known in the Yambol province, combined with evidence from the city of Kabyle, would allow a comprehensive investigation of a Roman landscape in this part of the Thracian Plain. While more focused studies integrating survey and excavation results have been done in other regions of Thrace in southeast Bulgaria (Poulter 1983; Gotsev 2007; Baralis *et al.* 2016), in Yambol large-scale, integrated, multidisciplinary investigations have been limited to the prehistoric site of Drama (Lichardus *et al.* 2000; Gaydarska 2007).

19.4 Discussion

TRAP excavations revealed a Late Roman site with rich, if shallow, archaeological deposits within its substantial fortification walls. The Early Iron Age materials at T1 may indicate that the northwest wall section was close to a suspected Early Iron Age component of the site. The Early Iron Age fragments in the topsoil, and the single fragment embedded in the wall, were all in secondary context, transported during clearing, levelling, and wall construction. While Bakardzhiev (2011) suggests the wall section in T1 itself could be of Thracian date, given the drywall faces composed of large blocks and the Early Iron Age sherd, the lower courses of the wall in T2 are of similar construction and contain no evidence of a date earlier than the third century AD.

A single Early Iron Age sherd embedded within a wall only provides a *terminus post quem*, and the absence of earlier stratigraphic layers argue against a pre-Roman date. Instead, the materials from within the fortification wall in T2 indicate two phases of construction, the earlier dating to the third century AD and the later to the sixth. T3 contained a small single-room structure holding a remarkable abundance of pottery (55 nearly complete vessels), one third-century coin, a hoard of sixth-century Byzantine coins, and substantial evidence of food storage. The coin finds and pottery assemblage in T3 are consistent with T2, dating the fortified site to the third to sixth century.

Farming at Dodoparon appears typical of Late Roman and early Byzantine Thrace, with the possible exception

of higher than average millet consumption (see stable isotope analysis in Chapter 17 for long-term evidence of a millet-based diet). The two most common crops found at Dodoparon were millet and free-threshing wheat. Both were common crops in the Roman period in the Mediterranean and Eastern Europe (Popova 1999; Šoštarić and Küster 2001; Teserro *et al.* 2013; Petó *et al.* 2015). Free-threshing wheat, millet, rye, and broad beans were, for example, found at both Roman/Byzantine Abritus and Nicopolis ad Istrum in Northern Bulgaria (Popova 1999; Popova and Marinova 2000).

Bitter vetch seeds, as the name suggests, are toxic to humans and some animals, although their toxicity can be reduced through soaking and boiling in water (Valamoti *et al.* 2011). Since Roman times, bitter vetch was often used for medicine, animal fodder, or as a famine food, and was an important pulse crop in Greece and Bulgaria until the early twentieth century (Zohary *et al.* 2012; Miller and Enneking 2014). Bitter vetch was present as a rare find at both Abritus and Nicopolis ad Istrum (Popova 1999; Popova and Marinova 2000), albeit in a lower a proportion than found here.

No cereal chaff was recovered from any samples from T1, T2, or T3. This lack may in part arise from small soil sample volumes or, more likely, it indicates that cereal processing was occurring either off-site or in an unexcavated area of Dodoparon. Since samples T3-A and -B came from the room fill, and no chaff was present, the recovered seeds probably spilled from storage vessels or containers in the room. The small percentage of crop weeds also confirms that cereals were being stored on site in a cleaned and processed form. This spatial division between processing and storage is consistent with other Roman and Byzantine archaeobotanical studies from Bulgaria (Popova 1999; Popova and Marinova 2000). With free-threshing wheat and millet as the main crops, relatively little processing would have been required to prepare the grain for use.

The quantity of storage vessels, tableware, metal implements, coins, and archaeobotanical remains found within the 4×6 m interior space of the central structure (T3) is remarkable. It is centrally located within the walls. It also served as a place to hide a coin hoard. The structure was most likely a storeroom, or at least a residential house with significant storage capacity. If it was a storeroom, its small size implies that others may have also been in use elsewhere within the walls, situated closer to areas of need. It remains unclear whether the storage served a private household, a military garrison, the purported sanctuary of Apollo, or some combination. Given the lack of high quality pottery, imports, or luxury goods, the last appears unlikely; the storehouse probably served either a modest household or was one of several for the fort's garrison.

The presence of transport vessels containing olive oil attests to Dodoparon's connection with sixth-century markets or exchange networks. They may represent military rations: the *annona militaris,* an in-kind tax that benefited the army, included oil from the time of Septimius Severus (Bowman *et al.* 2005, 381–2). Archaeobotanical studies confirm that the structure in T3 stored clean, processed crops, ready for consumption, exchange, or distribution, while the crop processing and food production took place elsewhere. The structure may have been a depot for these rations, with shelves full of tableware and storage vessels full of grain and oil, waiting to be distributed to the garrison. In this context, the small size of the structure, which might not allow sufficient living space alongside the storage, may argue for its use as a storeroom rather than a residence with storage.

The diversity of finds indicates that Dodoparon as was a multi-function site, rather than simply a fortified settlement or religious sanctuary. Within the fortifications, T2 yielded iron slag and implements, revealing metallurgy as one of the site's economic activities. Many local place names refer to the sources of raw metal in the proximity of Dodoparon, such as Meden Kladenets ('copper well') or Zlatari ('goldsmiths'). The village of Krumovo had an operating iron mine until 1990 (Raichevski 1984, 317–23). During his trip through the region during 1880s, Jireček described several iron mining shafts up to 5 m deep on the northern side of Dodoparon hill, but no residents had a memory of mining activities, indicating their greater age (Jireček 1888, 497). Besides the presence of iron sources in the environs, and the excavated residues of metal production, the presence of a sanctuary of Apollo itself may provide further evidence for metalworking. A second-century inscription at Malko Tarnovo, some 130 km to the southeast in the Strandzha Mountains, associates the cult of Apollo with a community of miners of Greek origin (*IG Bulg* 3.2, 1859; *cf.* Janouchová 2016). Taken together, this evidence indicates that Dodoparon may have been a metal production centre in a mineral rich hinterland between Kabyle and Hadrianopolis, perhaps supplying their garrisons (or its own) with refined metals or finished products.

The sanctuary to Apollo attested in Roman period inscriptions recovered near Dodoparon remains undiscovered. It is possible that the sanctuary lies somewhere within the fortified area and, like at Malko Tarnovo, was associated with the community behind metal production. Dodoparon's strategic location overlooking trade routes leading south towards the Aegean, combined with its relatively large size, impressive curtain wall, and evidence for engagement with the regional economy argue that the site was more than simply a sanctuary. It is on one of the relatively few significant hills encroaching on the Thracian Plain. Dodoparon appears to have been a multifunctional regional centre of habitation, defence, production, exchange, and perhaps religious activity. Similar hilltop sites like Tatul and Perperikon in southern Bulgaria are generally interpreted as sanctuaries (an interpretation that might be usefully revisited).

The final question addressed by TRAP investigations relates to the foundation and abandonment of the Roman site. Excavations revealed occupation beginning in the third century, a date corresponding to the presence of Roman military forces in southern Thrace between the second and fourth century. A Roman auxiliary cohort is attested at Kabyle, 40 km to the north, beginning in the second century (Velkov 1983, 234). Hadrianopolis, 40 km to the south, was the site of the Goth's victory over the armies of Emperor Valens in AD 378 (Ammianus Marcellinus 31.12.4). With Gothic and Roman armies intermittently operating nearby over the course of two centuries, it is likely that the unsettled situation prompted the foundation or expansion of a defensible multi-function site at Dodoparon, perhaps related to abandonment of lowland sites like the veteran colony at Stroyno (site 6018), as well as smaller farmsteads such as site 6021, 30 km to the northeast (Velkov 1983, 234; Ammianus Marcellinus 31.12.4; see Chapters 16 and 18 of this volume).

In terms of the site's demise, occupation is well attested in the sixth century, specifically by the coins dating to the reigns of Justinian and Justin II. The first three quarters of the sixth century appear to mark the *floruit* of Dodoparon, followed by its sudden abandonment. The late sixth century was a period of turmoil; in AD 587, the Avars besieged Beroe, Diocletianopolis, and Philippopolis, well defended cities on the interior of Thrace. While they were not always victorious, they were competent at siege warfare (Petersen 2013, 381). Velkov attributes the abandonment of Kabyle to the Avars, and suggests that other towns and cities in the province of Thrace also faced destruction at that time (Velkov 1983, 234).

The existence of over 50 near complete vessels, some (but not all) of which were burnt, suggest destruction or hasty abandonment, perhaps in the wake of a siege. Archaeobotanical analysis revealed the presence of bitter vetch, an animal fodder and famine food, which may indicate restricted access to the farmlands below the hill, or be part of risk-management strategies at the site (especially since the insect damage may indicate that the vetch had been stored for a long time). On the whole, abandonment may be more likely. No skeletal remains were found in the excavated trenches, burning in Trench T3 was only partial, and coins and metal finds were not removed from the site (either by refugees or assailants). None of the exposed stretches of fortification appear to have been damaged. Deposits next to the walls do not bear signs of burning, although such evidence may have been obscured by the dark and humic topsoil. The site's great weakness may have been the lack of water on the hilltop. The streams running off the hill itself are the closest known source of water. The inhabitants could have used an undiscovered or now-failed well, and they probably stored some water, but it is likely that a lack of water made the site vulnerable to siege. Dodoparon's inhabitants, recognising this weakness, may have left before any attack occurred. In that case, burning could have resulted from intentional (if partial) destruction either by the refugees as they fled (perhaps attempting to deny their food stores to an enemy), or by assailants who found only an abandoned settlement, or even by natural fires started by lightning hitting the peak.

Further investigation could reveal more about the last days of the site. Even if the turmoil of the late sixth century was not the immediate cause of Dodoparon's demise, the movements of armies, arrival of new peoples (Slavs as well as Avars), and the abandonment of cities such as Kabyle may have disrupted the social and economic networks upon which the site depended. Once the invasions of the late sixth century disrupted trade routes, reduced the demand for metal, interrupted access to surrounding agricultural land, or transformed regional socio-political arrangements, Dodoparon may have languished until it was abandoned.

19.5 Conclusion

Mapping of surface remains and excavation of three trenches at Dodoparon in 2010 confirmed that it is a large (ca. 4 ha), fortified, multi-functional Late Roman hilltop settlement. Dodoparon is a well-preserved example of such a site with fortification walls standing 3 m high and archaeological deposits 0.6–2.5 m deep. Unlike Perperikon or other 'hilltop sanctuaries', Mediaeval building activity has not damaged earlier structures or deposits. The well preserved and stratified Late Roman remains set Dodoparon apart from other, contemporary hilltop sites.

Under the deep humic topsoil, stratified deposits inside the walls allowed dating of activity at Dodoparon, based on coins, pottery, and wall construction techniques. Excavated portions of the site revealed habitation between the third and sixth century AD, perhaps bracketed by the abandonment of lowland sites in the turmoil of the third century, and the destruction of major regional centres like Kabyle in the late sixth century. No context was dated before the third century, so early Roman, Hellenistic, or Iron Age habitation remains unattested. We expected to find extensive Mediaeval and post-Mediaeval remains, especially since one of the most prominent earth and stone 'platforms' still visible on the surface of the hilltop was targeted. No such finds, however, were discovered. The limited scope of excavations may explain the lack of earlier or later material.

Dodoparon was a multi-function site. The central trench (T3) revealed the stone foundation of a Late Antique structure containing a coin hoard dated to AD 536–572, a large quantity of ceramics, metals, and significant archaeobotanical remains, indicating that it was either a storeroom or a residential house with significant storage capacity. Slag, fragments, and implements found in T2

underscored the importance metal production at the site, which lies in a known ore-bearing region. The crops grown at the site were typical of Late Roman and Early Byzantine Thrace, primarily grains (including millet) and legumes. Wine amphorae from Romania, repurposed for oil storage, indicate connections with regional exchange networks, possibly the Roman military supply system. Inscriptions previously discovered nearby indicate that a sanctuary of Apollo was located at or near the site, but no trace of it was found (other than the circumstantial evidence that cults of Apollo may be related to metal-producing communities in Thrace). Overall, it appears that Dodoparon was a fortified settlement engaged in agriculture, metal production, and regional trade, and perhaps supporting a sanctuary.

Cautious excavation strategies, designed to extract maximum amounts of archaeological and ecological information from the remains paid off, generating contextual assemblages for later study. Analogous sites have been either excavated without the benefit of archaeobotanical and residue analyses or, as noted above, excavated and interpreted to conform to pre-existing (often nationalist) ideas about Thracian culture and religion. At Dodoparon, excavations produced a valuable body of material allowing investigations of past life at a sixth-century hilltop settlement of regional importance. These preliminary investigations have laid the groundwork for further study of Dodoparon's chronology and function, including the processes behind its establishment and demise.

Notes

1 T1 plan DOI:https://doi.org/10.6078/M7NV9GBK; T1 exterior wall photo DOI:https://doi.org/10.6078/M7J38QM5

2 T2 plan DOI:https://doi.org/10.6078/M7DB7ZWF

3 T2 trench photo DOI:https://doi.org/10.6078/M78K7742; T2 SE profile DOI:https://doi.org/10.6078/M74T6GDB

4 Charred seed assemblage from Dodoparon – DOI:https://doi.org/10.6078/M76M34XB

5 Images of millet, broad bean, bitter vetch, insect damaged bitter vetch, and rye from the central trench (T3) at Dodoparon – DOI:https://doi.org/10.6078/M7125QQC

20

Classical and Hellenistic transport amphorae from the Yambol province

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Abstract *Fragments of transport amphorae dating to the Classical and Hellenistic periods from the Aegean and Black Sea regions were retrieved during Tundzha Regional Archaeology Project (TRAP) field survey in the Yambol province. Despite poor preservation, 13 diagnostic sherds from Chios, Heraclea Pontica, Thasos, and Lesbos were identified. Another 20 sherds can be ascribed to unidentified production centres located on the southern coast of the Black Sea and the northern Aegean. The presence of imported amphorae indicates that regional trade routes reached inland Thrace between the late sixth and late third century BC.*

Keywords *Thrace; Greek amphorae; Heraclea Pontica; Chios; Lesbos; Thasos; Black Sea; Aegean*

20.1 Introduction

Systematic field survey in the Yambol province conducted by the Tundzha Regional Archaeology Project (TRAP) recovered 85 recognisable fragments of transport amphorae. The state of their preservation was, however, very poor, since regular ploughing breaks up artefacts and exposes them to weathering. Many fragments from multi-period artefact concentrations were so worn that it was impossible to ascribe them to specific periods.

Sherds were identified based on shape and fabric. Fabric description used here derives from the system presented by Orton, Tyers, and Vince (2001, 238–9). A Munsell Colour Chart (Munsell 2000) is used to determine fabric and surface colours. Unless stated otherwise, morphology and chronology follow classification of Monachov (1999; 2003). Diagnostic sherds can be viewed in the digital amphora catalogue.[1]

Out of 85 amphorae fragments, the provenance of 33 sherds was determined. They originated in three main areas: the eastern Aegean (Chios and Lesbos), the northern Aegean (Thasos and the adjacent mainland), and the southern coast of the Black Sea (Heraclea Pontica; probably also Sinope) (see digital map and Table 20.1).[2–3]

20.2 Fragments from the South Black Sea region

Production of amphorae in the south Pontic region started in the late fifth century BC at Heraclea Pontica. At Sinope, production began around the turn of the fifth and fourth centuries BC, and at Amastris around the turn of the fourth and third centuries. Amphora production spread through the Black Sea Region during the Hellenistic, Roman, and Late Antique periods, persisting through the Middle Ages (Monachov 2010, 25; Vnukov 2010a; 2010b, 29; Opaiţ 2010).

20.2.1 Heraclea Pontica

In southwestern Thrace, the first Heraclean amphorae appear at the turn of the fifth and fourth centuries BC. During the first half of the fourth century they are very abundant, especially around the Bay of Burgas on the Black Sea coast. Around the mid-fourth century, Heraclean imports in Thrace are gradually replaced by amphorae produced in the northern Aegean (Tzochev 2010, 100). This phenomenon is visible in the assemblage from Seuthopolis dated to 310–260 BC. The Black Sea amphorae in Seuthopolis (from Heraclea Pontica, Sinope, and Chersonesos Taurica) together represent only 6% of total imported amphorae (Tzochev and Kiriatzi 2018, 545–555).

Two amphora toes retrieved during the TRAP survey in Yambol were from Heraclea Pontica (6034.04; 90228, see the amphora catalogue). The first fragment (6034.04) was discovered at a multi-period concentration (6034). This fragment reflects the earliest production at Heraclea, pithoid type I, dated from the end of the fifth to the first

Table 20.1 Chronological overview of provenanced amphorae from the Yambol study areas. The vertical lines mark the peak of imports into the study area

Fragment information			*6th century BC*		*5th century BC*				*4th century BC*				*3rd century BC*	
Inv #	*TRAP site*	*Provenance*	*550–525*	*525–500*	*500–475*	*475–450*	*450–425*	*425–400*	*400–375*	*375–350*	*350–325*	*325–300*	*300–275*	*300–200*
6034_04	6034	Heraclea Pontica						x	x					
90228	Kabyle chora	Heraclea Pontica								x	x	x	x	
61574_01	6034	Lesbos	x	x	x	x								
80667_02	8011	Chios						x	x	x	x			
80667_03	8011	Chios						x	x	x	x			
80667_04	8011	Chios						x	x	x	x			
80674_01	8011	Chios							x	x	x	x	x	x
60971_01	6038	Chios					x	x						
60404_01	8026	Chios					x	x						
71264_04	7019	Chios					x	x						
61601_02	6036	Chios		x	x	x	x	x						
61577_07	6034	Thasos										x	x	
61574_02	6034	Thasos							x	x				
61580_03	6034	Northern Aegean								x				
80650_02	8011	Northern Aegean												

quarter of the fourth century BC. The second Heraclean sherd (90228) was found during the 2008 pilot season in the scatter surrounding the ancient city of Kabyle. Its morphology places it near the end of pithoid production (I-A-2), or into the period of conical (II) or biconical (III) production. Considering these three possibilities, this toe likely dates to the last quarter of the fourth century or the beginning of the third century BC. Since amphorae of Heraclean provenance found during excavations at Kabyle all date to the turn of the fourth and third centuries BC (Getov 1995, 201), the date of this fragment is likely to be later, and the conical (II-A-1 to II-A-3) or biconical (III-3) morphology more likely. The fabric of both toes corresponds to that from other Black Sea production centres (discussed below).

20.2.2 Undefined southern Black Sea production centres

Based on their fabric, another 18 amphora fragments originated in the southern Black Sea. Unfortunately, the small size and poor preservation of the sherds prevent more precise classification. They all date, however, to the Classical or Hellenistic periods, since most of the fragments preserve parts of handles that are plain and oval in section, without any of the grooving characteristic of Roman production.

Fragments of south Pontic provenance typically display very hard fabrics, rough surface feel, and gritty cleavage. Inclusions consist of a varying amount of shiny black stones (pyroxenes), brown stones, white stones (quartzite and calcite), and grog. Fabric colour of this group is predominantly red-hued (16 of 18 sherds). Fabric core and margin are either red (2.5YR 5/6, 10R 5/6), light reddish brown (5YR 6/4, 2.5YR 6/3), or light red (2.5YR 6/6). The outer surface is most often light red (2.5YR 6/6). The two remaining fragments are lighter coloured (80664; 70159.3). One of the sherds is composed of pink fabric (7.5YR 7/4), while the second is light grey (10YR 7/2) with a very pale brown surface (10YR 8/2). Such fabrics are common to all major south Pontic production centres during the Classical and Hellenistic periods, including Heraclea Pontica, Sinope, and Amastris, as well as the recently described, but poorly defined production centre referred to as 'pseudo-Heraclean' (Vnukov 2004, 410; Monachov 2010). Since imports from Amastris are not yet attested in southern Thrace (Tzochev 2010, 99), the other production centres might be favoured.

Southern Black Sea fabrics are relatively easy to identify, an advantage when dealing with fragmented and badly worn field survey material. The fabric is also very hard, assisting preservation. Its distinctive colour and appearance make it easier to notice and collect during survey. The durable and obtrusive fabric, rather than a larger number of original containers, may account for the volume of south Pontic amphorae fragments identified in this study. These results should, therefore, be interpreted cautiously, as evidence of the existence of Black Sea contacts in the late fourth to early third century BC, rather than as an indication of the relative intensity of trade between inland Thrace and the Black Sea.

20.3 Fragments from the eastern Aegean region

Amphorae from Lesbos, Chios, Miletos, Clazomenae, and Samos represent the earliest Greek transport amphorae produced in the eastern Aegean. They are found along the Black Sea littoral (*e.g.*, Karnobat) beginning in the late seventh century BC (Tzochev 2010, 98; Panayotova *et al.* 2010, 259–61; Nedev and Gyuzelev 2011). The earliest finds of Lesbian amphorae from inland Thrace date from the first half of the sixth century, followed by Chian at the turn of the sixth and fifth centuries (Lozanov 2010, 85–6). The peak of their importation into Thrace occurs during the Archaic period, when Chian amphorae, followed by Lesbian, are the most common along the western Black Sea littoral (Cook and Dupont 1998, 143).

20.3.1 Lesbos

One toe of a Lesbian amphora (61574.01) was identified from a multi-period artefact concentration (6034). This toe belongs to the 'tumbler-bottomed' variant first described by Zeest (1960, 72–4), later refined more precisely as the 'fractional red' type by Clinkenbeard (1986, 358), although both of those descriptions have been disputed (Cook and Dupont 1998, 158). Recently, red-fabric production was designated the 'Lesbos-K' class by Monachov (as opposed to 'Lesbos-S' grey fabric production; 2003, 43–9). Following this typology, the toe should be classified as variant I-B or I-C, dating from the second half of the sixth century through the first half of the fifth century BC. The Lesbos-K fabric features different hues of red, depending on firing temperature and atmosphere. Both red and grey Lesbian fabrics contain characteristic silver mica, while some pastes also have other coarse inclusions (Whitbread 1995, 156–7).

Monachov assumed that grey production began earlier than red, in the third quarter of the seventh century (2003, 45). Handles from early forms of both red and grey types have, however, been found together at the Archaic necropolis at Abdera (Dupont 2011, 177). Those finds make it probable that they evolved together from the mid-seventh century.

Although literary sources mention production of wine on Lesbos during the late Hellenistic and Roman eras, amphorae from these periods have not yet been identified (Clinkenbeard 1982; 1986). The latest known red Lesbos-K type amphorae date to the mid-fifth century BC, and the latest grey Lesbos-S examples to the end of the fourth century (Monachov 2003, 49; Lungu 2011, 181).

The Lesbian toe in our assemblage dates to the latter half of the sixth century or the first half of the

fifth century. It is the earliest fragment in our amphora assemblage and one of the first 'Lesbos-K' fragments found in inner Thrace.

20.3.2 Chios

Chios was amongst the first centres of mass production of transport amphorae, beginning in the second half of the seventh century BC (Dupont 1982, 194; Monachov 2003, 11). The earliest Chian amphorae found in inland Thrace date to the turn of the sixth and fifth centuries (Lozanov 2010, 86), and peak in the first half of the fourth century, after which they are gradually supplanted by the products of other centres, especially Thasos (Getov 1995, 120–1; Tzochev 2010, 90; Lozanov 2010, 89). Chian amphorae continue to be produced until the first century BC (Grace 1961, fig. 47), but their shape does not change from the sharp pointed amphorae produced as early as the turn of the fourth and third centuries (Monachov's variant V-C). Grace and Savvatianou-Pétropoulakou (1970, 359–63) observe habitual depiction of amphorae on Chian coins until the third century AD, implying an even longer tradition of amphorae production.

TRAP survey recovered four toes and four rims of Chian provenance. The rims were all part of the same artefact concentration (8011). Despite their similarities, each rim fragment came from a different amphora. Two of the toes were found in the background scatter; the other two were part of surface concentrations 7019 and 6036.

Three rim fragments (80667.02, 80667.03, 80667.04) show similar morphological characteristics, classifying them as Monachov type IV or V, variants IV-B (straight-neck), or V-A or V-B (both conical). These variants were produced from the last quarter of the fifth century through the third quarter of the fourth century BC. Fragment 80674.01 was also found in concentration 8011, but it seems to belong to type V, variant V-B (conical), or V-C (sharp pointed). These variants were produced from the first quarter of the fourth century (V-B) through the first century BC (V-C).

Toe fragments 60971.01 (background scatter), 60404.01 (background scatter), and 71264.04 (7019) display similar morphological features, which also classify them as Monachov type IV or V, variants IV-A or IV-B (straight neck), or V-A (conical), which date from the third quarter of the fifth century to the end of the fifth century. The final sherd (61601.02), from 6036, more closely resembles earlier production of amphorae with a swollen neck (Monachov type III) dating from the last third of the sixth century to the last quarter of the fifth century BC.

All Chian fragments are characterised by smooth cleavage and surface feel, hard fabric, and even firing. The most frequent inclusions are white stones (quartz), soft white opaque stones, and brown to red stones, unidentifiable by visual inspection. Only one fragment contains rare flakes of silver mica (71264.04). Core and margin colours vary across red hues: red (2.5YR 5/6), light red (2.5YR 6/6; 2.5YR 6/8), reddish brown (2.5YR 5/4), and light reddish brown (2.5YR 6/3; 5YR 6/4). Surface colour is either the same as the core and margin, or it has pinkish tint (5YR 7/4).

Many of the eastern Aegean amphora sherds were badly weathered. Nevertheless, fabrics of Chian amphorae have a light orange-red colour and similar structure of inclusions, features which assist their identification. Dates of the retrieved fragments correspond with the peak of Chian imports into inner Thrace: the second half of the fifth century to the first half of the fourth century BC.

20.4 Fragments from the northern Aegean region

The last group of fragments was attributed to centres in the northern Aegean region. This production zone lacks well established boundaries. Lawall (1994, 116) defined it as extending from the Axios (Vardar) River to the island of Thasos. Karadima (2004, 155–9) expanded the area southward to include the island of Peparethos (Skopelos), located in the Sporades near the northern tip of Euboia, and eastward to the town of Ainos (Enez), situated at the estuary of the Hebros (Maritsa/Merich River).

This vague geographic boundary results from similarities in morphological traits shared by transport amphorae from the region. All are characterised by flattened shoulders, conical bodies, tall necks, and wedge-shaped rims (Lawall 1994, 156). To explain the 'common morphology', Lawall suggested that the entire region functioned as a single economic unit. He proposed the existence of a regional amphorae style, or *koine*, amongst producers (Lawall 1994, 156). This shared style makes it easy to ascribe amphorae to the northern Aegean, but it obstructs attribution to specific production centres within the zone. Therefore, the following discussion of sherds often includes several possible assignments.

The northern Aegean production centres attested in our assemblage probably include Peparethos, Mende, Thasos, and Ainos. Another type designated 'Murighiol' was also identified, but that centre has not yet been located. Despite recognising morphological similarities between Murighiol and Heraclean production, Monachov (2003, 79–80) ascribed the Murighiol type to the northern Aegean, an attribution we followed.

Regarding production dates, amphorae from Peparethos were produced from the fifth century to the middle of the fourth century BC, after which export rapidly declined until it ceased by the last quarter of the fourth century (Monachov 2003, 96–100). Production of Mendean amphorae began in the second half of the fifth century and continued until the late fourth century (Monachov 2003, 88–95). Thasian amphorae date from the late sixth or early fifth century (Bon and Bon 1957, 40), and continue until the beginning of the second century (Grace 1985, 18). The chronology of Ainos production remains poorly understood, but includes the period from approximately

the fifth through the third century (Karadima 2004, 159). Last, deposits containing Murighiol-type amphorae have been dated to the first half of the fourth century (Monachov 2003, 79).

The first examples of northern Aegean amphorae appear in southern Thrace during the last quarter of the fifth century BC, particularly examples with ring-toes or disk-toes. Such finds are scarce until the opening of southern Thracian markets during the late fifth and early fourth centuries. Thasos was the leading source of amphorae in southern Thrace at this time, and remained so through the second half of the fourth century, although examples from other northern Aegean centres have also been found (Tzochev 2010, 99). By the end of the fourth century, northern Aegean imports had decreased, but continued at a reduced level until the middle of the third century (260–230 BC), when a commercial recession can be observed in the interior of Thrace (Tzochev 2010, 101).

TRAP survey found four fragments that might be assigned to northern Aegean production centres. Two of them are from Thasos, including one handle bearing a stamp (61577.07) and a toe (61574.02), both from site 6034. The third fragment (61580.03), from the site 6034, and the fourth fragment (80650.02), from site 8011, are toes probably from the northern Aegean, but their provenance cannot be determined with certainty. All four fragments are characterised by micaceous fabric rich in white stones (translucent or opaque), with rare dark inclusions. Fabric is well sorted and hard, with smooth cleavage. Differences between fragments discussed below.

20.4.1 Thasos

Two fragments might be classified as Thasian production: a stamped handle and a toe (61577.07 and 61574.02 respectively). The handle was the only stamped sherd found during survey. It dates to the last quarter of the fourth century BC. The stamp, placed on the upper part on the handle, is rectangular, measuring 26×29 mm (originally larger but broken). Besides the legend Θ indicating the place of production, an eponym, Θ(), can be also seen. The stamp is covered by a calcareous crust, so only part of a triangle-shaped sign can be identified. Avram (1996, 59) dated the eponym Θ() to 316–295 BC based on three stamps found in Histria that depict either lightning, an alabastron, or a kantharos (Avram 1996, 125). Getov (1995, 30–1) published six corresponding stamps from Kabyle, two of them dated, one to the second half of the fourth century, another more specifically to 325–310 BC. These examples are associated with depictions of a trident, a thyrsos, or a kantharos. Tzochev (2009, 55–72), however, provided the most detailed chronology. He classified similar stamps as late-style Thasian eponyms type IV (314–309 BC). Parallels have been found in two burial mounds excavated in the Kazanlak Valley (Tzochev 2009, 65).

The second amphora fragment is a toe, perhaps of rare Thasian pithoid type I-B-3, dated to the first half of the fourth century (Monachov 2002, 61; 2003, 64). It has a predominantly light red (2.5YR 6/8) core and a light reddish brown (2.5YR 6/4) margin. The fabric appears similar to the stamped handle, which is, however, unevenly fired, resulting in a black core.

20.4.2 Murighiol or Ainos

The best analogy for a toe from site 6034 (61580.03), was found at the site of Nikonia and attributed by Monachov to the Murighiol type (Monachov 2003, 80), which he dated to the second quarter of the fourth century BC. Nevertheless, its morphological characteristics also correspond to Ainos production, which lasted almost three centuries (Karadima 2004, 155–61). The fragment has a light reddish brown (2.5YR 6/4) core with light red (2.5YR 5/2) surface.

20.4.3 Thasos, Murighiol, Mende, or Peparethos

A fragment from site 8011 (80650.02) may have originated from any of several production centres. It could, for example, belong to Thasian early biconic type II-B-1. The first finds of this type are dated to the last quarter of the fifth century BC, but are more commonly attributed to the first quarter of the fourth century (Monachov 2003, 66). Comparanda from the Panskoe I necropolis raises another option. This fragment could be Murighiol type, dated to the second quarter of the fourth century (Monachov 2003, 80). A Mendean flaring stem toe of Melitopoluskiy type II-C (Zeest 1960, 89) from the second quarter of the fourth century represents another parallel (Monachov 2003, 294). Finally, it could be classified as Peparethian type Solocha I-A, dating to the first half of the fourth century (Monachov 2003, 100). All suggested classifications, however, date the fragment to the early or middle of the fourth century. Thus, although the production centre of this amphora is uncertain, the approximate date of its manufacture can be determined.

In summary, northern Aegean production centres are represented in the assemblage by four fragments which all date to the fourth century BC. All share a hard reddish-brown fabric with inclusions of silver mica. Precise dates, such as that provided by the stamp (61577.07), are rare in field survey material, and we are very lucky to make this discovery. No amphora rim or toe can provide such good chronological information. Given the huge production area of the northern Aegean, as well as the popularity of Thasian amphorae during the second half of fourth century, it is surprising that only four diagnostic fragments were recovered.

20.5 Conclusion

Of the 33 identified amphorae sherds, 21 came from the southern Black Sea. The remaining 13 originated in the Aegean, nine from the Ionian Islands of Chios

and Lesbos and four from the northern Aegean. Two of the northern Aegean examples came from Thasos. The greater number of Black Sea sherds does not necessarily reflect more imports, but instead may result from better preservation and the obtrusiveness of their durable and distinctive fabric.

The chronological span of the material ranges from the second half of the sixth century to the end of the third century BC. Most fragments, however, date between the third quarter of the fifth and the third quarter of the fourth century. Only two fragments might date to the Archaic period (as per Table 20.1). Imports peak in the Classical period, with 13 possible sherds. The number of imported amphorae appears to decline during the first quarter of the third century, with one sherd dated securely, and two possibly, to this period.

Three sites yielded especially large numbers of transport amphorae sherds. Site 8011 produced six fragments: four from Chios (80667.02, 80667.03, 80667.04, 80674.01), one from the northern Aegean (80650.02), and one non-diagnostic sherd from the south Pontic region. These sherds date from the last quarter of the fifth to the third quarter of the fourth century (noting that 80674.01 may be later). Site 6034 produced five fragments: one from Heraclea Pontica (6034.04), one from Lesbos (61574.01), two from Thasos (61577.07; 61574.02), and one from elsewhere in the northern Aegean (61580.03). Dates for this material ranged from the second half of the sixth to the beginning of the third century. Site 7019 yielded one Chian sherd (71264.04) and five non-diagnostic south Pontic fragments, dating from the second half of the fifth through the fourth century. Since none of these sites is on a navigable river, it may be that a local road connected them with major trade routes to the Black Sea and northern Aegean.

Notes

1 Digital amphora catalogue – DOI:https://doi.org/10.6078/M7H41PHS

2 Digital map – DOI:https://doi.org/10.6078/M7WD3XND

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21

Greek and Latin inscriptions from the Kazanlak and Yambol regions ca. 500 BC to AD 300

Petra Janouchová

Abstract *Some 136 Greek and Latin inscriptions from the Kazanlak Valley and the Yambol province complement the archaeological data produced by the Tundzha Regional Archaeology Project (TRAP). The inscriptions clarify chronologies and add social and demographic detail to investigation of settlement patterns in the Tundzha River catchment. These inscriptions span the Classical, Hellenistic, and Roman periods, documenting evolving social and cultural practices amongst Thracians, Greeks, Macedonians, and Romans. The epigraphic record in Kazanlak shows signs of changing behaviour arising from cultural contact during the Classical and Hellenistic period. Inscriptions from the Roman period display standardisation in epigraphic production across both regions, most likely due to Thracian service in the Roman military.*

Keyword *inscriptions; Greek and Latin epigraphy; Seuthopolis; Kabyle; cultural contact; social organisation*

21.1 Introduction

Epigraphic evidence from the Kazanlak municipality and the Yambol province dates from 500 BC to AD 300. The character and contents of the 136 extant inscriptions reflect similarities in the socio-cultural status of individuals living in the two study areas during this era. Epigraphic data, by nature of their local origins, represent an independent line of evidence about how identity was constructed in the communities producing inscriptions (Schuler 2012, 63). Diachronic variation in proper names, in the social function of inscriptions, and in the factors motivating epigraphic expression all reflect demographic and social evolution in these communities, contributing to the broader picture of socio-cultural changes in both regions studied by the Tundzha Regional Archaeology Project (TRAP).

The number of inscriptions surviving in the larger Yambol province totals 79, while the smaller Kazanlak area has 57 inscriptions. When corrected for the size of the study area, Kazanlak leads in the production of inscriptions. Greater production of inscriptions reveals Kazanlak elites as open to adopting Greek practices during the Classical and Hellenistic periods, if only temporarily (Nankov 2012). The communities living in the Yambol province, conversely, produced fewer inscriptions, despite evidence for a Late Iron Age occupation in the region (see *e.g.,* Dimitrova and Popov 1978; Agre 2011; Iliev *et al.* 2012; *cf.* Chapters 14 and 16), interaction with Greek *poleis*, and attempts by Hellenistic rulers to conquer them (Hdt. 6. 33–41; Thuc. 2. 29; 95–8; Diodorus Siculus 18.14; 19.73; Arrian *Anabasis* 3.12.4).

The situation changed in the Roman period, when inscriptions from the two regions show broad similarities in form and content, reflecting a convergence in cultural and social practices. Inscribed objects became the carriers of standardised iconography and formulae. The alignment of the epigraphic evidence in Yambol and Kazanlak during the Roman period contrasts with the Late Iron Age, perhaps due to the impact of Roman rule on social structures, new modes of behaviour linked to this impact, and the appearance of new technologies and consumption patterns in an imperial setting. Similar trends have been documented elsewhere in the eastern provinces of the Roman Empire (*e.g.*, Vranič 2014, 39). Epigraphic production in the eastern provinces changed with the onset of Roman rule, but it is unclear whether this change was top-down, from Roman policy, or bottom-up, from peer pressure and adaptation to a new social, cultural, and

political environment. In any case, ostentatious display of status remained the underlying motivation for epigraphic production from the Classical period through the third century AD. Only the means of such display and its socio-political settings evolved through time.

21.2 Kazanlak research area

The Kazanlak dataset consists of 57 Greek and Latin inscriptions representing all surviving evidence from the area at the time of writing, collected from various epigraphic corpora including *IG Bulg*, SEG, CIL, *etc*. (for coded dataset see the digital catalogue of Kazanlak inscriptions).[1] These inscriptions originate from throughout the Kazanlak Valley, an area of 700 sq km bounded in the north by the Stara Planina, in the south by the Sredna Gora, in the west by Tazha village, and in the east by Gorno Izvorovo (Fig. 21.1). This area includes, but is somewhat larger than, the TRAP study area, extending further to the west. Of the 57 Kazanlak inscriptions, 50 were carved into stone, and seven into the surface of metal objects. Fifty-three were written in Greek, three in Latin, and one is bilingual. The inscriptions can be divided into two main chronological groups: an early group of nine Classical and Hellenistic inscriptions representing 16% of the total, and a later group of 48 Roman era inscriptions representing the other 84%. The main differences between the two groups are: (a) the demographic profiles of the commissioners, who shift in status and occupation, and (b) the motives for making inscriptions, which diversify over time as they serve a broadening social group.

21.2.1 Kazanlak in the Classical and Hellenistic periods (Late Iron Age)

The nine Classical and Hellenistic inscriptions from Kazanlak are found on objects commissioned by elites. The Kazanlak Valley, which was then in the territory of the Odrysians, served as a centre of activity for the Thracian aristocracy in the latter half of the first millennium BC (Strabo 7, frag. 47; Domaradzki 1991, 136–8; Archibald 1998, 213–39; Dimitrova 2015, 12). While the inscriptions were all commissioned by aristocrats, they differ in function and place of deposition. Six inscriptions were found on funerary objects from burial mounds, which we assume were seen by participants in the burial rites, *e.g.*, family members and other elites, while three were placed on stone monuments in open-air locations, where the public could have seen them.

21.2.1.1 Inscriptions on funerary goods

The six inscriptions from burial mounds appear on the surface of funerary objects made of silver or bronze. The texts consist of personal names (or abbreviations or initials) stating the ownership of the object, its capacity, or its value. Although the texts are written using the Greek alphabet, the personal names are mostly Thracian, like Seuthes or Dyntas, and the language of other words varies between Greek and Thracian as far as we can tell (*cf.* Dana 2015, 247–51). These six inscriptions can be divided into two groups: three early inscriptions dated between 500 and 350 BC, and three inscriptions from the late fourth century BC associated with the 'royal' burial of Seuthes III. The first group of inscriptions encompasses three short texts that consist of individual letters possibly

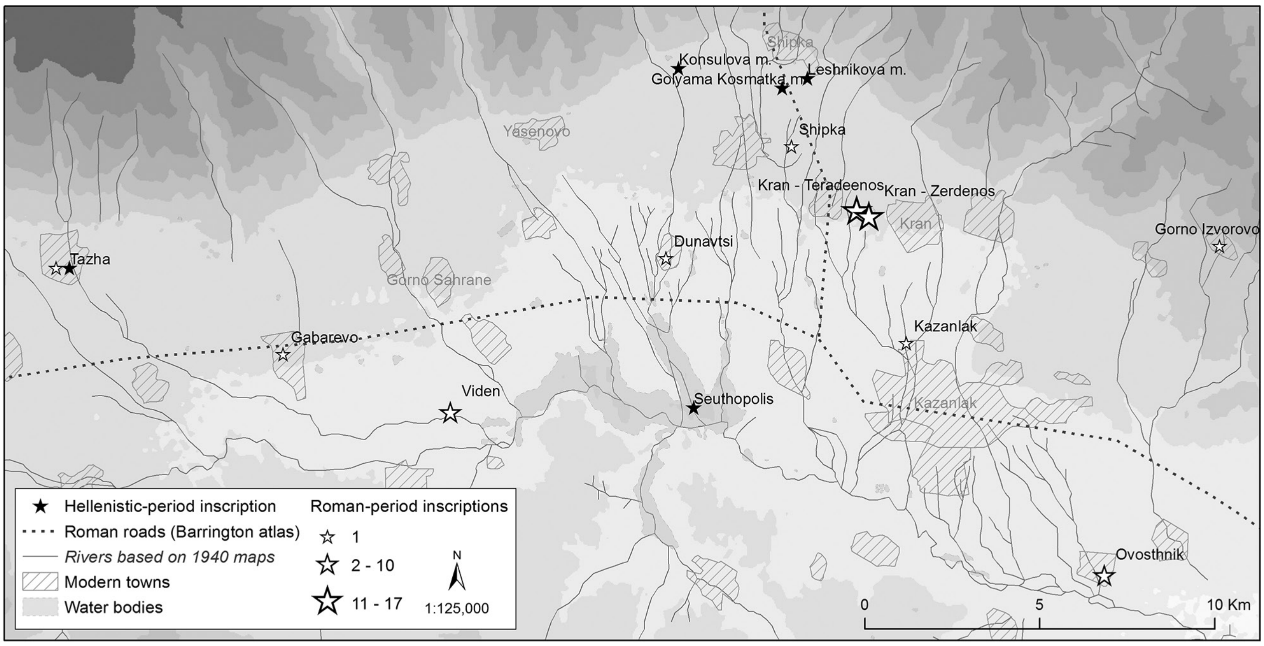

Figure 21.1 Map of the Kazanlak research area indicating inscriptions dated to the Classical-Hellenistic and Roman periods.

denoting the contents or the owner of the inscribed object. Since they are so abbreviated, their interpretation is still a matter of debate. One of these inscriptions was found on a silver mouth of a wineskin in the Konsulova mound (Kitov and Krasteva 1993, 61–2; Kitov 1994, 85–6), while another was written on a silver vessel from the Leshnikova mound (SEG 55:742; Kitov and Theodossiev 1995, 317–36; Kitov 1999, 1–20). The third appears on a silver vessel from an unknown location in the Kazanlak Valley, probably a burial mound (SEG 46:851; Kitov 1995, 5–21). In the Konsulova mound inscription (which is not in the SEG), the text ΡΚΣΝ Δ possibly indicates the content of the vessel, as is also the case with the text ΚΥΛΙΚΙΑΔ ('four kylikes') on SEG 46:851. The text ΔΥΝΤΑΣΣ [Ξ or Ζ]ΕΙΛΑΣΣ in SEG 55:742 indicates that it belonged to a Thracian bearing name 'Dyntas, son of Zeilas' or, possibly, to someone named 'Dyntozelmis' (Dana 2015, 247). Determining the meaning is difficult in part because some of letters are irregular and reversed, which could indicate that the Greek alphabet was a novelty in the Kazanlak Valley at the time (prior to about 350 BC), used only sporadically and in elite contexts.

The second group of three inscriptions comes from the monumental burial mound Golyama Kosmatka, associating it with Seuthes III and dating it to the late fourth or early third century BC (Kitov 2005d, 39–54; Manov 2006, 27–34; Dana 2015, 251). Seuthes III is known from Greek sources as a Thracian leader of the late fourth century BC. Diodorus Siculus describes him as *basileus* ('king') of the Odrysians. Initially an ally, Seuthes III later fought against the Macedonian Lysimachus, maintaining some sort of autonomy in the process (Diodorus Siculus 18.14; 19.73; Arrian *Anabasis* 3.12.4; Tacheva 2000, 10–12; Heckel 2006, 248; Delev 2015, 53–4). More importantly, Seuthes III is traditionally considered to be the founder of the 'royal', Hellenistic city of Seuthopolis, now submerged under the Koprinka Reservoir, 10 km south of Golyama Kosmatka (*cf.* Dimitrov, Čičikova and Alexieva 1978; see Chapters 6 and 8). The brief inscriptions were written in correct Greek, demonstrating the author's (and possibly also owner's) understanding of the Greek letter forms and language. The three inscriptions record Seuthes' ownership of a bronze helmet (SEG 55:776 c) and two silver vessels (SEG 55:776 a, b). The inscriptions on a jug and a *phiale* also mention their weights, explicitly using 'Alexandrian' measures, *i.e.*, the system of weights and measures introduced to Thrace by Alexander the Great and his followers. Ownership was properly expressed using Seuthes' name in genitive singular (ΣΕΥΘΟΥ). The correct spelling and grammar, as well as the use of Alexandrian weights, suggest familiarity with the Greek language and the system of measures used in contemporary Greek and Macedonian society.

Objects made from precious metals, including vessels, jewellery, and weaponry, are known from many burials across Thrace during the Classical and Hellenistic period. According to Greek sources, these precious objects were obtained through gift exchange between, or tribute collection by, Thracian elites, symbolising their wealth or broad network of contacts (Thuc. 2. 97. 3; *cf.* Archibald 1998, 225–30; Loukopoulou 2008, 139–63). Objects with inscriptions denoting the name of the owner most often appear on precious drinking implements. These objects were likely used and displayed during elite drinking parties during the owner's life, and later deposited in the grave as part of the festivities marking the owner's burial, as described by Herodotus (5.8).

According to anthropological theory, the vessel's owners used the inscribed, precious items to ostentatiously display their wealth and signal to potential followers an ability to amass wealth and resources, and thus secure appropriate gifts for their retainers (the so-called 'Big Man' model, *cf.* Sahlins 1963; Whitley 1991). A leader's power within the community existed as long as he was able to attract followers. Such ostentatious consumption and display of wealth are common features of elite competition in pre-state societies, and likely occurred all over Thrace (*cf.* Bliege, Bird and Smith 2005).

21.2.1.2 Inscriptions on stone stelae

In addition to the six inscriptions on funerary objects, three Greek inscriptions in stone were found. *IG Bulg* 3.2, 1731 and 1732 date to the early third century BC and come from Seuthopolis, the royal residence of Seuthes III and his entourage. The fragmentary inscription *IG Bulg* 3.2, 1730, which is usually dated to the second century BC, was found in the ruins of a Mediaeval castle above the village of Tazha, 18 km west of Seuthopolis (Fig. 21.1). Although this inscription has been associated with the area around Seuthopolis because its text featured personal names traditionally connected with the house of the Odrysian kings (Mihailov 1964, 145), it is important to remember that the city itself, inhabited for only about two generations, was abandoned during the third century, so this second-century inscription must have been displayed elsewhere.

Personal names in these texts are predominantly Thracian, such as Spartokos, Seuthes, Sadalas, Hebryzelmis, Teres, Satokos, and Amaistas. The two exceptions are Berenike, the wife of Seuthes III, who was probably Greek or Macedonian (Tacheva 2000, 10), and Epimenes, possibly a masculine name of Greek or Macedonian origin (Ognenova-Marinova 1980, 47–8; Calder 1996, 167–75; Tacheva 2000, 33–5). These names indicate that the inscriptions were commissioned by Thracians, often interpreted as members of aristocracy.

The inscriptions in stone represent public communications between the elites and their communities, serving as a new instrument for establishing status, exercising power, or building identity and cohesion (Velkov 1991, 7–11; Calder 1996, 169). The fact that elites from the interior of Thrace chose Greek as their

language of public communication has led to the belief that Thracian aristocrats, at least, were Hellenised (Calder 1996, 169; Delev 1998, 378; Theodossiev 2001, 14–15; but see Vranič 2012 for a critical re-evaluation). In this conventional view, the process of Hellenisation is usually defined as an adoption of the Greek language, religion, and customs, combined with the use of imported goods (Hdt. 8.144; Zacharia 2008).

21.2.1.3 Seuthopolis as a 'Hellenised' settlement

Since its discovery, Seuthopolis has been interpreted as a Hellenised settlement because of its Hippodamian layout and Greek-style urban architecture. Archaeological excavations revealed the existence of a central square, possibly an agora, and houses resembling the Greek *pastas* type (Dimitrov 1961, 94–100; Dimitrov, Čičikova and Alexieva 1978, 6–14). Together, these features suggest Greek or Macedonian influence, or perhaps even the presence of foreign architects. The famous 'Seuthopolis inscription' *IG Bulg* 3.2, 1731 includes references to typical Greek institutions, such as the *boule*, *agora*, *hieron*, and *bomos*, which indicate that Seuthopolis had a council, an agora, a sanctuary, and an altar in the Greek fashion.

The same inscription identifies two Greek cults practised in Seuthopolis: that of Dionysus and that of the Great Gods of Samothrace (Calder 1996, 169). *IG Bulg* 3.2, 1732, which was commissioned by the Thracian Amaistas, specifies that he served as a priest of Dionysus, adding further evidence for the existence of that cult. Both inscriptions were found during excavations at Seuthopolis and likely came from the same sanctuary. The evidence does not reveal whether the cult of 'Dionysus' represents a syncretic application of a Greek name to an indigenous deity, or the importation of a Greek deity. If it was an import, the degree to which the cult was adapted to its new Thracian environment is not known. The Greek text mentions the Greek deity and the Thracian origin of the priest, but the nature of the cult remains obscure. At a minimum the inscription reveals a familiarity with Greek religious tradition in Seuthopolis.

Another argument for the Hellenisation of Seuthopolis is the language of inscriptions and the fact that they were publicly displayed. The texts are not only Greek, but written using rather conservative invocation formulae found across the Greek speaking world, such as ΑΓΑΘΗΙ ΤΥΧΗΙ ('good fortune') or ΔΕΔΟΧΘΑΙ ('having been resolved by [ ]'; Velkov 1991, 7–11; Calder 1996, 169). *IG Bulg* 3.2, 1731 also specifically prescribes that the text should be publicly displayed in the agora, another common expectation of Greek inscriptions (Velkov 1991, 7–11). The use of this formulaic terminology, combined with an explicit order for public display, suggests familiarity with the Greek epigraphic habit, if not the presence of Greeks in Seuthopolis.

The inscriptions of Seuthopolis, together with archaeological evidence from its excavation (Dimitrov, Čičikova and Alexieva 1978), suggest Greek or Macedonian influence on elite architecture, religion, and inscriptions. This evidence, however, does not indicate how far this influence extended beyond the aristocratic class.

21.2.1.4 Graffiti

Literacy rates in the ancient world were low, and the ability to read (and especially write) was largely restricted to elites (Harris 1989; Cribiore 2005). The percentage of the population that was literate rarely exceeded 10%. Even in Athens, the most epigraphically active Greek *polis*, literacy rates reached perhaps 15% during the Classical period (Harris 1989, 327). Additionally, literacy was a fuzzier concept in Antiquity than today. Some people knew how to read, but not write, while others had a limited 'functional literacy', often defined as the ability to write one's own name or read a simple text. Literacy was a skill important for a relatively small part of the population with particular skills or occupations, such as merchants, soldiers, artisans, or other specialists, who used it to better pursue their professions (Boring 1979, 1; Ong 1982, 94; Harris 1989, 5).

Graffiti denote short inscriptions scribbled on everyday material, such as broken sherds. In Thrace, graffiti mostly come from aristocratic grave contexts, or from the merchant, soldier, and artisan communities who regularly interacted with the elites (Archibald 1998, 229–31; Domaradzka 2005). Over 130 Greek graffiti were found on imported and local pottery during rescue excavations in Seuthopolis in 1953, suggesting that functional Greek literacy and numeracy extended beyond the Thracian aristocracy (Chichikova 1984). A typical graffito from Seuthopolis consists of a few letters, representing personal names or numerals. The graffiti include both Greek and Thracian names, such as the typical Thracian name Seu[thes], the common suffix [-ze]lmi[s], and the Greek names Aristoxenos, Here, Kle[-], and Filai[-] (Dimitrov, Čičikova, and Alexieva 1978, 22–3; Chichikova 1984, 52–3; 74). Although the status or occupation of the vessel's owners remains unknown, the presence of personal names of various ethnic background suggests a multi-ethnic community was residing at Seuthopolis.

Moreover, the numeric graffiti use the acrophonic numeral system, in which the first letter of the Greek word for a number represents a numeral. This system was commonly used among Greek speaking communities to denote the value of contents or capacity of a vessel (McLean 2002, 58–61). It was probably brought to Seuthopolis by Greek or Macedonian merchants or soldiers, who were familiar with this system from their previous activities.

In addition to the graffiti, a few styli and seal rings were also found in Seuthopolis. These provide additional evidence of local production of texts and ownership markings. Emil Nankov has used the presence of graffiti and writing utensils to argue that the population of Seuthopolis was composed of Hellenised Graeco-Thracians and

possibly Macedonians, largely from military backgrounds (Nankov 2012, 109; 120). According to Nankov, Greek language and writing were in general use amongst not only elites, but also merchants and soldiers who routinely used it for business and social interaction.

The context of graffiti and writing utensils at Seuthopolis suggests these artefacts were likely to be made and used in the town. The absence of graffiti in Seuthopolis' hinterland may arise from the lack of excavations in Classical and Hellenistic settlements outside the city. The fragility of graffiti, furthermore, inhibits their survival in the plough-zone, where they suffer from mechanical and chemical wear. The failure to find graffiti outside Seuthopolis may, however, also indicate that there were few elites or specialists living in the countryside – or living in the valley at all outside the brief period of habitation at Seuthopolis.

21.2.1.5 Discussion: the depth of literacy in the Kazanlak Valley

In the Kazanlak Valley during the Classical and Hellenistic periods, inscriptions on non-perishable materials were rare, and only elites commissioned them to serve their own needs. Some were made on metal vessels that only elites would have seen, while others were inscribed on stone monuments for public display. In either case, one of their functions was to enhance the status of the elite commissioner, either in the eyes of other elites or the wider community (*cf.* Woolf 1994, 117).

While the available evidence from Seuthopolis supports the proposition that the population was Hellenised, the lifespan of Seuthopolis was limited to some 50 years. It was founded after 340 BC (Nankov 2015, 404–5, suggests the date of foundation as 313 or 310 BC; *cf.* Nankov 2008, 45) and abandoned in the third century (Calder 1996, 169, uses numismatic data to suggest 229 BC as the final horizon of the Hellenistic city). Besides inscriptions from Seuthopolis and nearby elite mound burials, only one other fragmentary inscription *IG Bulg* 3.2, 1730 from Tazha attests to use of the Greek language in the Kazanlak Valley. One would expect that after decades of living in close contact with Graeco-Macedonian soldiers and merchants, residents would develop the sort of mixed culture common in contact zones (Malkin 2004, 356–9; Woolf 2009, 209–10). We might expect such a society, in the Thracian case, to adopt the sort of cultural practices attested in inscriptions and graffiti, like the use of Greek and the practice of commissioning inscriptions. During its relatively short life, the community of Seuthopolis adopted some aspects of Greek epigraphic practice under the influence of Seuthes III, an advocate of Graeco-Macedonian culture. After the death of Seuthes III, no further securely dated evidence of inscription making, or of writing in any form, in Greek or any other language, is to be found before the Roman conquest, when the cultural dynamic changed dramatically.

Perhaps the writing of Greek, and the entire 'Hellenised' way of urban life, were limited to Graeco-Macedonian soldiers or veterans stationed in Thrace, along with the Thracians who had joined them for Alexander's conquests and the Successor's wars that followed his death. Seuthes III, a 'Hellenised' veteran, promoted Greek culture and a Greek way of life to maintain his status and prestige after he had expelled Macedonian rulers from his corner of Thrace (Malkin 2004, 353; Vranič 2012, 40–1). The limited duration of Seuthopolis attests, however, to the fragility of the multicultural community he founded.

21.2.2 Kazanlak in the Roman period

Evidence from the first to the fourth century AD in the Kazanlak Valley shows that epigraphic expression was no longer dominated by Thracian elites operating from one (semi-) literate centre. The use of inscriptions was now distributed among multiple sites and their commissioners came from wider socio-demographic groups, such as Thracians, foreigners, soldiers, veterans, and magistrates.

A total of 48 inscriptions from the Kazanlak Valley date to the Roman period. Some 43 texts are from the second or third century AD. The inscriptions are mostly carved into stone, with one bronze military diploma. The stone inscriptions appear on marble tablets (ca. 30×20 cm), often bearing a relief depicting the Thracian Rider or a standing deity. The texts are mostly published on behalf of an individual, or his or her closest kin. Unlike the previous period, when inscriptions are associated exclusively with elite interactions, the extant Roman inscriptions show more variability in their function: 41 of the inscriptions are dedications to local or Greek deities, such as Heros, Apollo, Daphne, Heracles, and Asclepius (Oppermann 2006, 222–6). Two inscriptions, *IG Bulg* 3.2, 1741 and *IG Bulg* 3.2, 1741(2) bis, are funerary, while one is a military diploma CIL XVI 106 (Dana 2013, 229). Four are too fragmentary to specify their function.

21.2.2.1 Archaeological context of inscriptions

Most texts come from archaeological excavations at three sites, which have all been interpreted as sanctuaries. Two of these sites are located near the modern town of Kran in the northeastern part of the study area. The third is near Viden in the southwest.

The two sanctuaries near Kran provide the largest collection of votive offerings. The first sanctuary is located ca. 0.5 km west of Kran in the 'Bostandzhiyska Koriya' locale and dated from the mid-second to the early third century AD (Tabakova 1959a, 104; site 4123; *cf.* Chapter 6). Of 69 votive offerings found at this sanctuary, 15 were dedicated to Apollo *Zerdenos*. The second sanctuary near Kran is in the 'Atemov Oreh' locale, ca. 2.5 km southwest of the first sanctuary and dated to the third century AD (Tabakova-Tsanova 1980, 173–94; site 2044 and 2046). Most of the 65 offerings from this sanctuary appear on stelae and contain representations of the Thracian Rider

(Oppermann 2006, 224). Only 16 bear inscriptions, mostly to Apollo *Teradeenos*, Heracles, and Asclepius. Between them, these sanctuaries yielded 134 votive objects, mostly tablets, but also sculptures, lamps, and altars (Tabakova 1959a, 97–104; Oppermann 2006, 224). Inscribing a votive object was not routine; only about 20% of all offerings are inscribed; for every inscribed tablet, four anepigraphic objects were dedicated.

The sanctuary near Viden is in the 'Bentat' locale, about 2 km northwest of the village. Based on personal names, letter cutting style, relief comparanda, and associated archaeological evidence, the lifespan of this sanctuary has been dated from the Hellenistic period to the turn of the third and fourth centuries AD (Tabakova-Tsanova 1961, 203–19). It produced 30 anepigraphic dedications and eight with inscriptions. Thirty-five bear representations of the Thracian Rider, and three others of Apollo and Daphne (Tabakova-Tsanova 1961, 203–19; Domaradzki 1991, 127; Oppermann 2006, 222).

Comparing the identity of dedicands in the three sanctuaries, the two sanctuaries at Kran appear to have been frequented by soldiers, veterans, and city council members, who mention their status in the text of the dedications. The driving factor for these dedications may have been the location of the sanctuaries along the main road connecting Augusta Traiana with Novae on the Danube River, which ran through the Kazanlak Valley and over the Stara Planina via the Shipka Pass. Conversely, the sanctuary near Viden, which lay further from major roads, seems to have been used more by the Thracian population, or some other group, who do not emphasise their status or occupation in the inscriptions (Fig. 21.1).

21.2.2.2 Socio-cultural markers in the inscriptions

Greek predominates as the language of inscriptions during the Roman period in the Kazanlak Valley. Some 44 of the Kazanlak inscriptions are Greek (92%), three are Latin (6%), and one is bilingual (2%). The inscriptions, however, do not indicate any clear ethno-linguistic division, such as indigenous Thracians preferring Greek and newer arrivals Latin. The prevalence of Greek reflects the valley's location with respect to the so-called 'Jireček Line', the linguistic border running through the Balkans that divides the areas where most inscriptions are in Greek from those areas where most are in Latin (Jireček 1911, 36–9). Traditionally, the Jireček Line runs through the natural boundary created by the Stara Planina, just north of the Kazanlak Valley. Proximity to this boundary makes the mix of languages in the Kazanlak Valley inscriptions unsurprising (Dana 2015, 253). No precise statistics for Thrace as a whole exist, but Minkova (2000, 1–7) claims 1,200–1,300 Latin inscriptions have been found in Bulgaria compared with ca. 3,000 Greek inscriptions (Mihailov 1956–1997; see also the 'Hellenization of Ancient Thrace Database', Janouchová 2014). These figures produce a ratio of about 70% Greek to 30% Latin, with variation from region to region.

The personal names occurring in inscriptions from the Kran and Viden sanctuaries attest to dedications by Thracians, as well as by soldiers, veterans, and immigrants of other ethnicities. Some dedicands bore Thracian names, *e.g.,* Moukianos, son of Salos, in *IG Bulg* 3.2, 1746. Others had 'Romanised' or mixed Romano-Thracian names, such as Aurelios Markellos *stratiotes* ('the soldier'), in *IG Bulg* 3.2, 1747, Aurelios Ouales and his brother in *IG Bulg* 3.2, 1751, or Markos Aurelios Beibianos and his brother Markos Aurelios Moukianos in *IG Bulg* 3.2, 1756. These 'Romanised' Thracian soldiers adopted Roman names and naming habits when they returned to Thrace after service in the Roman army as a sign of Roman citizenship.

Some of the dedicands likely participated in the civic organisation of the Roman province *Thracia*. A very fragmentary dedication from Kran (*IG Bulg* 3.2, 1753), for example, was commissioned by a nameless *bouleutes* ('member of a city council'). No evidence exists for any Roman settlements in the Kazanlak Valley large enough to have a council, so the magistrates probably came from Augusta Traiana, the closest city with a council, which was located some 30 km southeast in the Sredna Gora foothills (Ivanov 2012, 471). Inscriptions commissioned by city council members, including retired Roman military personnel, were a common feature in the Roman east. In Bithynia, for example, retired officers of higher rank emerged as a new elite in major cities (Fernoux 2004, 198–200). Most extant inscriptions come from this class of ex-military elites, often stating their membership in a city council or mentioning their status as soldiers or veterans in order to declare their identity and enhance their prestige (Woolf 1994, 117; Topalilov 2013, 185–94). These inscriptions fit an Empire-wide pattern beginning in the second century AD, in which elites advertised their status and achievements on funerary monuments (Woolf 2004, 160).

Although Thrace was a *provincia inermis*, one without a permanent legion, the epigraphic evidence documents a military presence in the Kazanlak Valley. The bronze military diploma, CIL XVI 106 from Gabarevo, located in the north-western part of the valley, dates to AD 157 and probably belonged to a Thracian who served in Syria-Palestine before returning home (Dana 2013, 229). A bilingual Greek-Latin inscription from Shipka, *IG Bulg* 3.2, 1741 bis, was dedicated to a fellow Celsus Marius, from Cohors II *Bracaraugustanorum*, stationed in Moesia Inferior, by Markos, son of Traidakos, soldier from Cohors II *Numidia*, stationed in Dacia. The epigraphic evidence does not suggest a permanent military settlement in the Kazanlak Valley, but shows the military background of individual dedicands.

Compared to the Hellenistic period, Roman inscriptions reveal more information about a dedicand's occupation, achievements, and social standing. The content of the

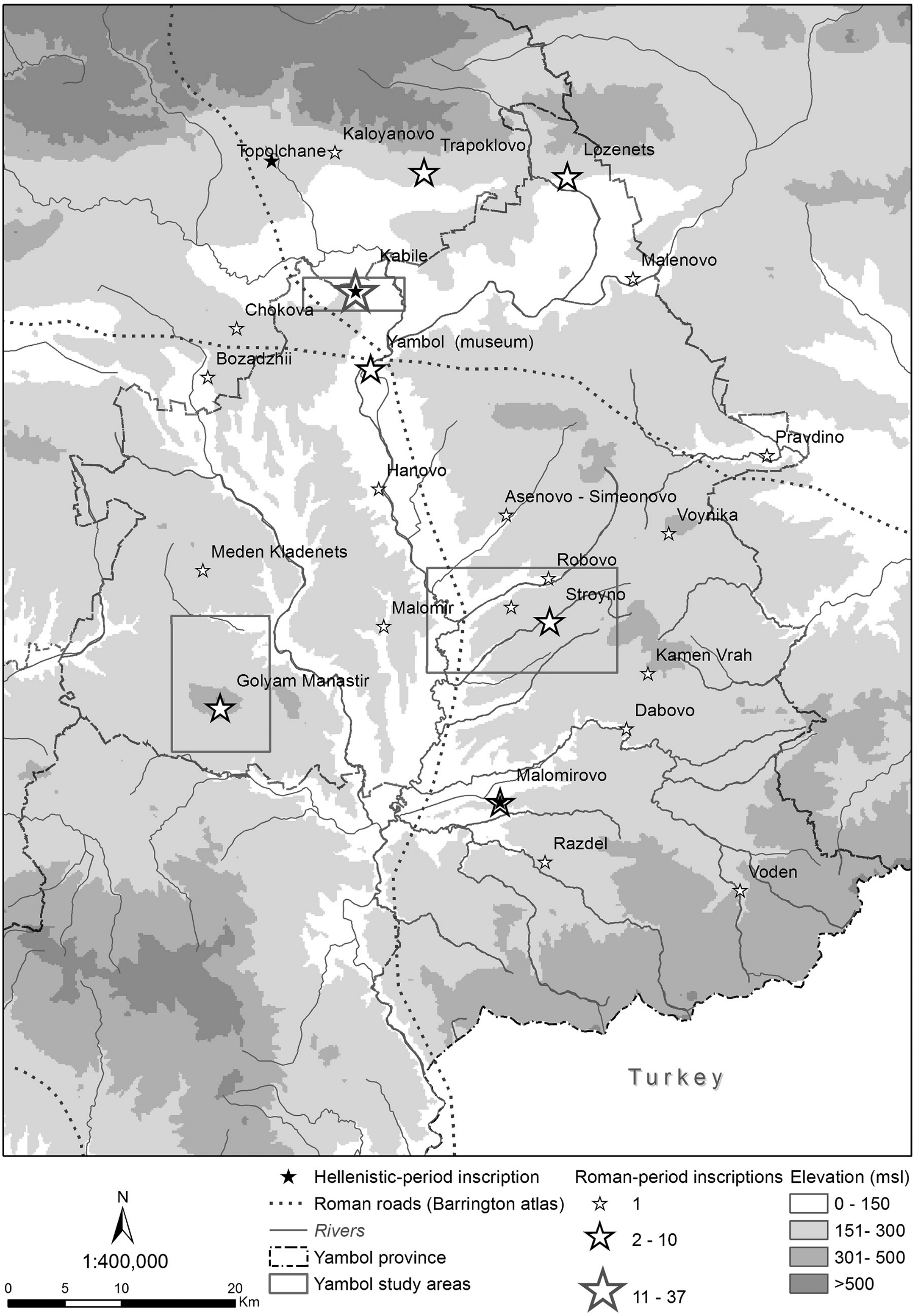

Figure 21.2 Map of the Yambol study areas (including the 2008 pilot project near Kabyle), noting inscriptions dated to the Classical-Hellenistic and Roman periods.

inscriptions reflects socio-cultural circumstances, such as the disappearance of aristocracy and the growth of city elites. The fundamental motivation, however, remains unchanged: enhancing status and individual prestige. As such, during the Classical period inscriptions name aspiring local aristocratic leaders, while during the Roman period, they name soldiers, veterans, and magistrates (Woolf 2004, 160).

In the Classical and Hellenistic periods, inscriptions had been created to display status in aristocratic contexts like elite drinking parties and mortuary rites. In the Roman period, they advertise participation in a new social order built around Roman citizenship, military service, and municipal leadership. The adoption of Roman names as a result of military service, use of formulae typical for Roman epigraphy, alignment of iconography to Roman norms, and the occasional use of Latin all proclaimed status in this new context (*cf.* Bliege Bird and Smith 2005, 233–5).

21.2.2.3 Discussion: long-term changes in epigraphic expression in Kazanlak

The epigraphic evidence reflects changes in the socio-cultural milieu in the Kazanlak Valley from the fifth century BC to the third century AD. Throughout this era, Greek remained the principal language of inscriptions, regardless of the dedicand's origin. Inscriptions initially established the autonomy and status of Thracian elites. Later they briefly promoted an elite culture encompassing Greek, Macedonian, and Thracian elements. These short-lived attempts were superseded by the arrival of Roman rule and the disappearance of identifiably Thracian aristocrats from the epigraphic record. A new, more epigraphically active elite emerged, one which derived its position from Roman associations, military service, and civic office.

21.3 Yambol research area

Although TRAP investigated only a small part of the 3,355 sq km Yambol province, this section discusses the epigraphic corpus from the entire modern region. It includes the environs of Kabyle, extending approximately 20 km around the ancient city and into the modern province of Sliven. The corpus encompasses a total of 79 Greek and Latin inscriptions (see the digital dataset for Yambol).[2] Seventy-two of these inscriptions were carved on stone monuments, six on metal objects, and one on a terracotta tablet. Fifty-nine were written in Greek, 18 in Latin, and two were bilingual. The inscriptions can be divided into two chronological groups: an early group of four Classical and Hellenistic inscriptions (500–1 BC), and a later group of 75 Roman inscriptions (AD 1–300).

Most inscriptions in the Yambol province come from Kabyle, a regional centre founded by Philip II on the bend of the Tundzha River. During the early Hellenistic period, Kabyle served as a counterpart to Seuthopolis (Velkov 1991, 7–31). It had a much longer lifespan, however, housing a military garrison under Roman rule. The permanent presence of Roman auxiliary units influenced the character of the whole region (*cf.* Chapter 18 and Chapter 19). A military road crossed the Thracian Plain, connecting Kabyle to the Greek cities of Perinthos and Selymbria in the Propontis (Madzharov 2009, 231–7). This road enabled movement and trade, as attested by amphorae found in the region (*cf.* Chapter 20) and the increased presence of non-Thracian personal names in the inscriptions discussed here.

21.3.1 Yambol in the Classical and Hellenistic period (Late Iron Age)

Kabyle's role as a Hellenistic regional centre and military garrison is attested numismatically, historically, epigraphically, and archaeologically.

Based on numismatic finds from the region, Handzhiyska and Lozanov (2010, 269) describe Kabyle as 'both as an important consumer of imported goods and a centre of redistribution'. The spatial distribution of bronze coins minted or countermarked at Kabyle during the third century BC indicate that the city's sphere of influence extended approximately 20 km to the foothills of Stara Planina in the north, the Manastirski Vazvishenniya in the southwest, and the village of Botevo in the south (Draganov 1993, 87–99; *cf.* Chapter 19). Along the Tundzha River, coins minted in Kabyle have been found as far as Seuthopolis in the northeast and modern Elhovo and Srem in the south.

Demosthenes describes Kabyle as one of the cities conquered by Philip II during his campaign in 341 BC (Dem. 8.44; 10.15; Velkov 1982, 14–16). The so-called 'Seuthopolis inscription' *IG Bulg* 3.2, 1731, found during rescue excavations at Seuthopolis, mentions a contemporary settlement at Kabyle, which served as the seat of a Thracian *paradynast* Spartokos (SEG 42:661; Velkov 1991, 7–11; Calder 1996, 167–78; Handzhiyska and Lozanov 2010, 262). In this inscription, Kabyle is presented as a prosperous Hellenistic city with various sanctuaries and an agora. Archaeological excavations confirm the existence of Hellenistic fortifications enclosing some 30 ha, but otherwise reveal little about the city itself due to their limited extent, compounded by the fact that Hellenistic strata are buried deep below later Roman and Late Antique deposits.

Only three inscriptions (Agre 2011, 134) from the Yambol province are securely dated to the Classical or Hellenistic periods, with one additional text dated to the transition between the Late Hellenistic and Early Roman periods. Two of these four inscriptions were found at Kabyle, carved into stone and intended for public display. The other two were carved into objects made of precious material and deposited in burial mounds as part of the funerary offerings.

21.3.2.1 Inscriptions on funerary goods

The earliest inscriptions from the Yambol area come from monumental burial mounds, interpreted as belonging to local Thracian elites based on their lavish contents (Agre 2011; Kitov and Dimitrov 2008). The inscribed objects served as status markers within the aristocratic class, analogous to finds from monumental burials in the Kazanlak Valley.

The first inscription comes from the Dalakova mound, a fourth century burial near Topolchane, 12 km north of Kabyle. An inscribed golden signet ring (SEG 58:699) was found during the excavation in 2007 (Kitov and Dimitrov 2008, 25–6). It bears retrograde text ΣΗΥΣΑ ΤΗΡΗΤΟΣ ('belonging to Seusa(s)/Seuthes, son of Teres') and a depiction of a bearded man. Signet rings were used by elites to signify ownership and verify identity. They served as a symbol of membership in a circumscribed community of high status. The presence of other grave goods confirms the elite social standing of Seusas/Seuthes, including a golden *phiale* reworked into a burial mask, two silver *rhyta*, other metal vessels, weapons, and imported red-figure pottery.

The second inscription on an item from a burial was found inside the Golyama mound, located between the villages of Malomirovo and Zlatnitsa near Elhovo, ca. 50 km south of Kabyle (Agre 2011). This mound produced rich funerary goods, again indicating the elite status of the owner, including a golden wreath, golden signet ring, weapons, silver and bronze vessels, Greek red-figure pottery, Greek amphorae, and local pottery. One of the decorative silver *rhyta*, which depicts a hunting scene, was incised with a simple inscription consisting of three Greek letters: ΑΙΣ with a three-bar sigma (Agre 2011, 134). Another letter may precede the A, but it is impossible to tell based on the publication. The text may signify the contents of the vessel or its owner, possibly associated with the occupant of the grave. According to the excavator, the grave belonged to an 18–20 year old man, a Thracian aristocrat of the mid-fourth century BC (Agre 2011, 214–30). The inscribed silver vessel likely served as status symbol, as did the signet ring. Inscribed objects from similar contexts in the Kazanlak Valley served the same purpose.

21.3.2.2 Inscriptions on stone stelae

Two fragmentary inscriptions in stone were found during excavations at Kabyle. The first inscription (SEG 42:643; Velkov 1991, 11–12; no. 2) has been dated to the Hellenistic period based on letter shapes and the content of the text. Specifically, Velkov links the occurrence of words ΒΑΣΙ[ΛΕΥΣ] ('king'), ΤΗΣ Π[ΟΛΕΩΣ] (genitive of *polis*, a Greek city state), and ΓΑΛΑ[ΤΑΙ] ('inhabitants of Galatia') to a formal relationship between with the inhabitants Kabyle and those of Galatia, the latter being Celts who passed through Thrace in the third century BC.

The second inscription (Velkov 1991, 12; no. 3), dated approximately by letter forms to the Late Hellenistic or Early Roman period, is difficult to interpret. It could be a decree issued by the *boule* of Kabyle or another city (Velkov 1991, 12 suggests Mesambria). Both inscriptions reinforce the idea that Kabyle served as a political centre, issuing or receiving formal decrees and maintaining relations with other Black Sea cities.

21.2.3.3 Discussion: Late Iron Age epigraphic production in Yambol

Pre-Roman inscriptions from Yambol are associated with the activities of local elites. Inscribed objects like a golden *rhyton* or signet ring were deposited in the tombs, where they denoted ownership and authority, advertising the status of their aristocratic owners. The two inscriptions in stone from Kabyle were produced after the Macedonian conquest and subsequent foundation of the regional centre. Although fragmentary, they document relationships with other polities and signify a degree of autonomy at Kabyle.

Considering Kabyle's role as a regional centre, it might be expected that graffiti like those from Seuthopolis would be found, but surprisingly few have been recovered (Nankov 2012). Domaradzki mentions only two graffiti on amphora sherds (1991b, 62). If more exist, they await publication. In part, the paucity of Hellenistic inscriptions from Kabyle reflects extremely limited excavation of Hellenistic contexts, yet it remains surprising. Inscribed objects from associated burials are also lacking; 10 elite mound burials dating to the Hellenistic period have been excavated nearby, yielding local and Greek funerary goods, but no inscriptions (Getov 1991).

In the Kazanlak Valley, the Thracian leader Seuthes III provided a new impetus for publishing inscriptions. His patronage of epigraphy appears short-lived, and he had no successors before the arrival of the Romans. Even though a contemporary Thracian paradynast, Spartokos, is attested in Kabyle, no analogous inscriptions related to him have been found. Only one of the stone inscription dates to the third century. The lack of epigraphic evidence is surprising because the leaders from both Seuthopolis and Kabyle minted their own coinage, with legends in the Greek alphabet, as was customary for Macedonian kings of the same period. Only one fragmentary inscription dating, possibly, to the second or first century BC has been found in Kabyle and its hinterland. The lack of later Hellenistic inscriptions may not be surprising, considering that it reflects a broader decline in economic activity and the minting of coins, as well as a decrease in imported items (Lozanov 2006, 147–52).

21.3.2 Yambol in the Roman period

Epigraphic activity in the Yambol province resumes only under Roman rule, specifically during the second century AD, when a permanent military garrison was stationed

in Kabyle (Getov 2003, 12–3). Seventy-five inscriptions have been found dating to AD 1–300. Of these, 37 come from Kabyle, while the remaining 38 originate at other sites along the Tundzha River, its eastern tributaries (the Gerenska, Azmaka, and Popovska rivers), and the main road connecting the interior of Thrace with the Propontis (Fig. 21.2).

21.3.3.1 Archaeological context of inscriptions

Kabyle dominates the epigraphic record of the region. Starting in AD 135/6 it hosted a permanent Roman garrison (Getov 2003, 121–3). Inscriptions from Kabyle indicate it was the *Cohors II Lucensium*, an auxiliary unit stationed there until the end of second century (AE 1999, 1370–1; Velkov 1991, 12–15; nos. 4 and 5). A bilingual inscription dated to AD 205–208 (SEG 42: 646 a–b; Velkov 1991, 18–21; no. 10) indicates that after AD 193 *Cohors I Athroitorum* may have replaced *Cohors II Lucensium*.

The spatial distribution of Latin inscriptions in Yambol shows Kabyle as the centre of the Latin-writing community, which should probably be equated with the Roman garrison. Texts are concentrated in and around Kabyle, having been found near the modern villages of Stroyno, Trapoklovo in the Sliven province, Malenovo, Asenovo, Meden Kladenets, and Lozenets (Fig. 21.2). Stroyno represents the most distant findspot, approximately 40 km southeast of Kabyle. Most texts have an official or semi-official character: two military diplomas, one boundary stone, one official inscription mentioning *caesar*, and two private texts in Latin on bronze objects about individuals using names of Roman origin (*e.g.,* AE 1999, 1372–3; Velkov 1991, 15–16; nos. 6 and 7; AE 2007, 1259–60; Boyanov 2007, 69–73; see digital dataset for details).[2]

The spatial distribution of inscriptions was influenced not only by the military presence in Kabyle, but also by various religious networks connecting the administrative centre with the areas to the south. Usually, texts cannot be associated with a specific archaeological site, as they were often found in secondary context, or their findspot was recorded imprecisely, *e.g.*, 'in the village', 'in the vicinity of the village', etc. The contents of the inscriptions, however, indicate that at least some of the findspots were connected by personal or religious networks. These dedications were made in Greek or Latin, often to deities bearing Greek names, such as Asclepius or Zeus, or to local deities, such as the heroes Zbelthiourdos, Tisasenos, and Aularkhenos. Dedications to 'ancestral' Apollo included the epithets *Patroos*, *Genikos*, and *Geniakos* and were connected by personal ties between the dedicands, including one case where the same family (of the priest Apollodoros) appeared on inscriptions at Kabyle and Dodoparon (see Velkov 1991; Janouchová 2016) and another case where the same Roman family name (Avilius) appears at both Kabyle and Stroyno (Boyanov 2006, 235–6; 2008, 209–10, Chapter 18 this volume). Religious networks, as well as military connections, thus extended at least 40 km from Kabyle.

21.3.3.2 Socio-cultural markers in the inscriptions

A total of 75 Roman-era inscriptions come from the Yambol study area. Of 37 texts found at Kabyle, 23 are Greek, 12 are Latin, and two are bilingual. The other 38 inscriptions from the hinterland include 33 in Greek and five in Latin. The percent of Greek inscriptions is lower in Yambol (76%) than in the Kazanlak Valley (93%), but corresponds with expectations for the Roman province of Thracia as a whole (see above). The number of Latin inscriptions was probably augmented by the presence of the garrison at Kabyle, where Latin was used as the language of administration. When the inscriptions found at Kabyle are excluded from regional statistics, the percent of Greek inscriptions rises to 87%.

Based on the appearance of some typical Latin features in Greek inscriptions, such as age rounding and specification of military rank, Velkov (1991) has argued that Latin was the language of official communication at the garrison. It would have been spoken by immigrants of western origin, like the soldier Valerius Proculus, the cavalrymen Lucius Valerius and Valens (Velkov 1991, 28–29; no. 37), or Valeria Festiva and Ulpius Vitales (Velkov 1991, 29–30; no. 38). Greek, conversely, would have been used for the private affairs of people of Thracian and Greek origin, *e.g.*, dedications and funerary inscriptions. The bilingual inscriptions were commissioned by Romans and supplemented by exact translation to Greek, *e.g.*, the bilingual funerary text *IG Bulg* 3.2, 1777, which was commissioned by Gaius Avilius Valens, a member of an old Roman family, for himself and his wife Satria Marcia (Boyanov 2008, 209). The prevalence of individuals bearing Roman names in Latin and bilingual inscriptions suggests that Latin was used mainly by immigrants from the western Mediterranean who identified as Roman, and that Latin did not much effect the epigraphic habits of the local population identifying as Thracian or Greek.

Inscription *IG Bulg* 5, 5636, dated to AD 144, attests to the permanent presence of Greeks in Kabyle. It mentions Greek inhabitants of the city who built and dedicated the temple of Hermes *Agoraios*. Velkov postulates that the main architect of the temple was possibly Narkissos, son of Zenon, from Perinthos (SEG 42:647; *IG Bulg* 5, 5636; Velkov 1991, 17; no. 8 and 13). Personal ties with the Propontis are not surprising, since Kabyle was connected with Greek cities at Perinthos and Selymbria by a military road and the Tundzha/Maritsa River systems (Madzharov 2009, 231–7).

Use of mixed Roman and Thracian names and military ranks reveals the service of Thracians and Greeks in the Roman army. People declare their connection to the army by using the label of *stratiotes*, 'soldier' or 'veteran', or by listing the rank they held in the Roman army. *IG*

Bulg 3.2, 1774 mentions Markos Oulpios Apolinarios *soummos kourator* ('official of mid-rank, curator') and Markos Oulpios Arkhelaos *aktarios* ('official in charge of wages'). *IG Bulg* 3.2, 1776 commemorates the *iatros* ('physician') Alexandros, son of Dilaeos (Velkov 1991, 30; no. 39). Finally, SEG 42:650 includes the *princeps* ('military official of high rank') Aurelios Poseidonis (Velkov 1991, 24; no. 20).

References to civic magistrates, like members of council, are also present, even though the closest city councils were over 80 km away at Augusta Traiana or Mesambria. The council members are represented on two dedications, one to Apollo and one to the Three Nymphs (*IG Bulg* 3.2, 1844; *IG Bulg* 5, 5652). The identity of only one council member is known: Aulouzenis, son of Hermodoros, who came from Mysia and has a Thracian name (*IG Bulg* 5, 5652). As a council member, Aulouzenis had considerable status, and so it was important for him to record his achievements on a monument displayed to sanctuary visitors.

21.3.3.3 Discussion: Roman presence and status in Yambol

The Yambol dataset from the Roman period shows a high proportion of military personnel on inscriptions, unsurprising considering the military garrison at Kabyle. The textual analysis of personal names and statements of origin indicate a strong Greek presence in the region, which is again unsurprising given the geographical proximity to the Greek-speaking coasts of the Aegean, Propontis, and Black Sea. The findspots fall along major roads and rivers, where settlements and outposts might be expected. Regional authority was concentrated in Kabyle, which served as a communication node and cultural centre.

Roman era inscriptions from Kabyle and beyond emphasise, advertise, and enhance achievements (Ivanov 2008, 142–5), much like contemporary inscriptions from the Kazanlak Valley. It became fashionable to state one's position and accomplishments in funerary or dedicatory inscriptions across Thrace and indeed the Roman world (Ivanov 2008; Woolf 2004).

21.4 Conclusion: Yambol and Kazanlak compared

Although the Yambol study area is nearly five times larger than its counterpart in the Kazanlak Valley, the former has only a few more inscriptions than the latter (79 versus 57), yielding a higher density in Kazanlak. During the Classical and Hellenistic period, the density of inscriptions is almost 12 times higher in Kazanlak than Yambol (1.3 inscriptions per 100 sq km vs 0.11 inscriptions per 100 sq km). During the Roman period, the density in Kazanlak is four times higher than in Yambol (8.14 inscriptions per 100 sq km vs. 2.11 inscriptions per 100 sq km). This difference may indicate a disparity in the number of inscriptions produced, reflecting divergent cultural and social practices between the two areas, but it might also reflect variations in preservation or recovery.

21.4.1 Late Iron Age

The surviving epigraphic evidence supports the thesis that Kabyle and Seuthopolis were important centres of administration, religious life, and culture. Both cities were regional centres, urbanised by Philip II of Macedon in the case of Kabyle, and returning veterans of Alexander's campaign led by Seuthes III at Seuthopolis. Both cities managed regional administration and housed a variety of specialists, *e.g.,* soldiers, veterans, and craftsmen, whose existence is expressed in the inscriptions. Inscribed funerary objects appear in graves belonging to the Thracian aristocracy in both regions as markers promoting the owner's elite status. The adoption of the Greek epigraphic habit was limited to a small cadre and did not survive long after the death of its main promoters like Seuthes III. At Kabyle, the Thracian aristocrats maintained relations with Greek poleis, but the adoption of Hellenic culture was more limited than at Seuthopolis, despite the proximity of Kabyle to Greek coastal cities and the circulation of coins between the Thracian Plain and the Black Sea coast.

The scarcity of pre-Roman epigraphic evidence from the Yambol area, represented only by two inscriptions in stone and two inscribed objects in elite graves, cannot be explained by low population density or a lack of elites. The Yambol area was not deserted during the Late Iron Age. Archaeological investigations have revealed Late Iron Age habitations: Dimitrova and Popov (1978) list 64 Late Iron Age sites for the province, while TRAP field survey inventoried nine Late Iron Age sites in a 37 sq km study area (*cf.* Chapters 12, 14, and 16). The recently published Late Iron Age elite burial with an inscribed silver *rhyton* from Malomirovo near Elhovo (Agre 2011), demonstrates the presence of elites, but inscriptions on the funerary goods are less common than in Kazanlak. The differential preservation or recovery of burial mounds in the Yambol area does not explain the discrepancy in numbers. Looting around Yambol does not appear any worse than around Kazanlak (*cf.* Chapters 8 and 14), and cannot explain the paucity of Classical and Hellenistic inscriptions from Yambol. A degree of conservativism towards producing inscriptions or using Greek script in the Yambol area remains the most likely explanation.

21.4.2 Roman Period

A phenomenon common to both areas is a sudden decline in epigraphic production from the second century BC until the Roman period. This hiatus possibly coincides with social changes in Thracian society at this time. The disappearance of inscriptions may involve the transformation or collapse of a social order based on elite interaction in the military turmoil of the wars of

Alexander's successors. In times of political instability and declining social complexity, 'artisanal' specialised production is prone to disappear first, a phenomenon typified by the loss of writing after collapse of the Mycenaean culture (Tainter 1988, 102–5).

After a hiatus of nearly three centuries, the habit of publishing inscriptions was reintroduced to both areas by the Romans, reflecting changes in the organisation of society. Epigraphic activity in the Kazanlak Valley was stimulated by religious activities, as opposed to the Yambol region where the garrison at Kabyle became the main driver of epigraphic production. New incentives catalysed the publication of inscriptions during the Roman period: hereditary rights, Roman citizenship, and the proclamation of status by the individual or their next of kin. In both areas inscriptions served primarily as a means of communication within an elite social group, reinforcing social hierarchy. The Thracian aristocracy disappeared from the epigraphic record in both areas, succeeded by a newly formed class of military personnel, civil servants, and Roman citizens. In both areas, the epigraphically expressive population at the turn of the second and third centuries AD consisted of residents belonging to the mid- to upper tiers of society, often involved in Roman military and civic affairs.

The spatial distribution of epigraphic production also reflects this new social order. Inscriptions in Kazanlak are found in distributed religious contexts, providing no evidence of a single regional centre (see the discussion of elite competition and antagonism in Chapter 10). Instead, the concurrent existence of multiple, mid-sized settlements suggests that political authority no longer resided in a central administrative centre in the Kazanlak Valley, but had been consolidated at the higher, super-regional level of the Roman Empire (see the discussion of Roman period settlement patterns in Chapter 10). The military presence at Kabyle, however, shaped not only the epigraphic record of the city itself but that of the whole region. Inscription findspots in the Yambol province are not distributed sanctuaries, as in the Kazanlak Valley. Instead, inscriptions cluster in the northern and central parts of the province, focused on the cultural and administrative centre of Kabyle.

A greater number of inscriptions survive from the Roman era in both regions, suggesting a more deeply rooted epigraphic habit. Similar increases, together with the appearance of new socio-cultural markers and standardised formulae, reflect homogenisation of epigraphic production not only in the Roman province of Thrace, but across the Roman world.

Abbreviations

AE: L'Année épigraphique
CIL: Corpus Inscription Latinarum
IG Bulg: Inscriptiones Graecae in Bulgaria Repertae
SEG: Supplementum Epigraphicum Graecum

Notes

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